FUNK & WAGNALLS NEW ENCYCLOPEDIA

VOLUME 1

A

to AMERICAN INDIAN LANGUAGES

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FOREWORD

Having spent a good many years as a teacher, I see very clearly that education is of critical importance in the rapidly changing conditions in which the world's peoples now live The task of education is to acquaint people, especially young people, with the total tradition of human thought and experience But, today, it is especially important that our minds remain uncluttered and free of the laborious memorization of thousands of facts and figures Our students must keep their minds clear and agile, for their task is to wrestle with the evolving concepts to which all the recently gathered knowledge —generated by new critical insights—is inevitably leading. The valuable facts of man's past, accumulated over thousands of years, must be preserved, however, as the basis for new concepts

The preservation of these facts and their easy retrieval is the function of the encyclopedia, just as their interpretation is part of the function of the school The encyclopedia, intended from the time of the ancient Greeks to contain the sum total of all knowledge, is still a basic tool of education, that human process through which the creative imagination is stimulated and made productive. One important element in this vital process is the development of useful and constructive habits of mind the deepening of intellectual curiosity, the development of critical faculties, the ability to evaluate a discussion, especially for logical progression and consistency; and the development of the intellectual self-confidence that comes from the feeling that one can apply acquired knowledge constructively and rewardingly The encyclopedia is essential in supporting this development

The scholars of the Renaissance believed that it lay within the realm of possibility for a man to learn all knowledge within his own lifetime. Today, even the most gifted scholar realizes that a man cannot grasp the entire macrocosm of known facts And, with the electronic assistance of computers and their unimaginable memories, the world's knowledge is multiplying so rapidly that the work of encyclopedia editors has become one of selection and organization rather than one of gathering only. The producers of a modern encyclopedia must, therefore, enlist the aid of people who are uniquely knowledgeable in the evergrowing number of special fields Each specialist writes about the subject he knows thoroughly What all the specialists have written, once gathered and collated, is then carefully edited Illustrations and graphs accompany the text to clarify it and to make it more useful Finally, it is fitted into an overall plan, the purpose of which is to help people easily find correct and readable information

As an educator who has used encyclopedias for years, I know that they must be accurate, objective, and free from prejudice if they are to fulfill the needs of students as well as those of the casual reader Although encyclopedias differ considerably in certain ways, all strive to provide the reader with information on a multitude of subjects Some encyclopedias are designed to provide very detailed information; others are prepared exclusively for children; still others limit their scope to one area of knowledge or concern The Funk & Wagnalls New Encyclopedia has been designed as a general encyclopedia, not giving preference to any one field but providing a well-balanced variety of information on questions of contemporary concern The adult reader will find the encyclopedia an indispensable companion throughout his life The student will find here the facts required for his studies, reading, and discussion

The name Funk & Wagnalls has become synonymous with the American image of dependable reference works The Funk & Wagnalls New Encyclopedia, it seems to me, has been designed and edited in this tradition. It is consistently reliable, fascinatingly illustrated, and easy to use. I am sure that this Funk & Wagnalls New Encyclopedia will, as did its predecessors, long hold an honored place and a well deserved reputation among English-speaking people everywhere as outstanding among reference books

George N Shuster
University of Notre Dame

FUNK & WAGNALLS NEW ENCYCLOPEDIA

PREFACE

The enormous strides taken in recent years by scientists, technologists, and educators have changed the world These advances have also posed a major challenge to those who record knowledge It is therefore apparent that an encyclopedia planned for the 1960's will not fulfill today's needs To meet this challenge, the late Dr Joseph Laffan Morse, Editor in Chief (1946-69) of Funk & Wagnalls encyclopedias for nearly a quarter of a century, planned the Funk & Wagnalls New Encyclopedia. The full realization of Dr Morse's program was left to his longtime associate and successor Editor in Chief (1969-75), the late William H Hendelson

Dr Morse's goal was to create an encyclopedia that is authoritative and comprehensive, that presents an unbiased view of the world, past and present, and that is priced low enough to be within the reach of the general public At the same time this encyclopedia must qualify as a work of value for every member of the family. Years of planning and evaluation went into the fulfillment of this goal

To set the guidelines for preparation of the new encyclopedia, Dr Morse posed—and, we believe, answered—two vital questions

"How should an encyclopedia be written to serve all Americans for school and home use?"

"What subjects are most likely to be looked up today by students and readers of varied interests?"

Let us turn to Dr Morse's first question, that of broad-based usefulness A modern general reference work must be both easy and rewarding to read Excessive technical detail on a subject, rather than adding to coverage, tends to make an encyclopedia cumbersome and difficult to read. The Funk & Wagnalls New Encyclopedia, therefore, has been concisely written in nontechnical language equally suited to the student or the casual reader interested in a date, a person, an event, or a place

Dr Morse's second question, that of subject selection, required extensive research School curricula were carefully analyzed to assure inclusion of material that provides information and answers to questions that come up on homework or study assignments In order to provide information for home and business use, library and other relevant sources were examined The material was organized into categories, with major emphasis divided among the following history and biography; cities, states, countries, and other geographic subjects, the sciences, including mathematics, medicine, and health, and general subjects, including law, education, social sciences, literature, and the arts

The resulting articles are presented to the reader in each volume in the familiar, easy-to-use alphabetical order In the front matter to volume one, the *Foreword* provides us with the educator's view of what we should expect from the encyclopedia On pages 49-64 the essay *On the Origins and Purposes of Thinking* examines our society's methods of utilizing the unique human attribute of thought, the origins of those methods, and the potential for change that may stem from such studies On pages 81-83 the system by which the encyclopedia is arranged—a system designed to simplify the process of finding information—is explained in the *Guide to the Use of the Funk & Wagnalls New Encyclopedia* Here the extensive cross-references used throughout this encyclopedia are carefully explained, as are all of the useful features of this encyclopedia.

Among the outstanding features of this encyclopedia is the inclusion in each article of certain supplementary information For example, persons mentioned in an account are identified by nationality, profession, or accomplishments Cross-references are made to individual biographies, or life dates are included in parentheses When technical terms are used they are immediately explained to lessen the need for further search

The selection of pictures, illustrations, drawings, charts, diagrams, and maps was considered of special importance for the inclusion of information most suitably presented in pictorial and graphic terms Full color and black and white illustrations and color accents have been used throughout the text Pictures were carefully gathered from museums, archives, and special collections throughout the world to provide explicit visual information that complements or provides added information to the text

The editors have also prepared a two-volume Index including more than 193,000 references, intended to broaden the usefulness of this encyclopedia and to enhance its value One of these volumes also contains a Bibliography to provide the reader with sources of additional information on a great variety of subjects he may wish to pursue in greater depth

In order to keep the new encyclopedia up to date and the owners abreast of events, the Funk & Wagnalls Yearbook is published annually as in the past for previous Funk & Wagnalls encyclopedias. The Yearbook covers the oustanding events and developments that have taken place each year and conforms to the same alphabetical arrangement and style as the encyclopedia

The Funk & Wagnalls New Encyclopedia directly reflects the talents of the men and women involved in its preparation. The firm of Funk & Wagnalls dates back to 1876 Complementing this experience is the authority of specialists reinforced by hundreds of contributors and consultants These are distinguished men and women who have risen to the top of their professions, many affiliated with governments, academic institutions, universities, museums, libraries, learned societies, industrial firms, publications, and international bodies

They have worked zealously with the editors to ensure that articles are current and factually correct The publishers are deeply indebted to all of these dedicated people, although space permits including only some of their names in the 39-page listings beginning on page 10 of this volume Their efforts assure the accuracy and objectivity of the new work, qualities for which past Funk & Wagnalls encyclopedias have been cited by eminent reviewers and critics as well as by literary organizations and specialized institutions

Many articles in the encyclopedia are signed, particularly those on major subject areas and articles dealing with specialized fields. The unsigned articles are the work of an experienced staff of writers and editors, well versed and supervised by expert advisers

This, then, is the concentrated labor of several years and the sum of the work of many It is with pride that we present an encyclopedia conceived to meet the challenges of today—the Funk & Wagnalls New Encyclopedia

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Professor of Hittitology, Oriental Institute, University of Chicago Professor of Hittitology at the universities of Uppsala, Sweden (1948-49) and Ankara, Turkey (1935-38) Member of archeological expeditions to the Near East for the study of Hittite texts, seals, and sculpture. Author of *Kumarbi, The Song of Ullikummi*

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United States Navy Metrication Project Officer Member, Department of Defense Metrication Panel, Metric Practice Committee, American National Metric Council, Metric Practice Committee, American Society for Testing and Material

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Late Professor of History, Columbia University Former U S Ambassador to Spain (1942-45) President, American Historical Association (1945), American Catholic Historical Association (1931) Member of the Executive Committee, Foreign Policy Association (1920-37)

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President, University of Notre Dame Trustee, Rockefeller Foundation, Carnegie Foundation for the Advancement of Teaching Member, Presidential Clemency Board Former member and Chairman (1969-72), U S Commission on Civil Rights, Commission on an All-Volunteer Armed Force, National Woodrow Wilson Fellowship Foundation Former Permanent Vatican City Representative to the International Atomic Energy Agency

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President Emeritus, Hobart and William Smith Colleges (1956-66) Trustee, Berkeley Divinity School (1946-56, 1966-69) and Hartford Seminary Foundation (1951-56) Dean, Christ Church Cathedral, Hartford, Conn (1946-56)

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Professor of Geography, University of Texas at Austin Recipient of the 1953 and 1958 prizes of the *Journal of Geography* and of the 1952 and 1957 Social Research Council Awards National Science Foundation Award (1963, 1967) Coauthor and editor of *A Geography of Europe, The Balkans in Transition, Yugoslavia and the New Communism,* and other books and articles

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Late Professor of American History, Columbia University Guggenheim Fellow (1966-67). Jefferson Memorial Lecturer, University of California at Berkeley (1966) Recipient of two Pulitzer Prizes for *Anti-Intellectualism in American Life* (1964) and *The Age of Reform* (1956) Author of *The Development of Academic Freedom in the U S, Great Issues in American History, The Progressive Historians,* and *The Idea of a Party System*

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Hunt, J. McVicker, PH.D.
Professor Emeritus of Psychology, University of Illinois Chairman, White House Task Force on Early Childhood First Director, Coordination Center National Laboratory of Early Childhood Education (1967-68), President, American Psychological Association (1951-52), American Psychological Foundation (1953-54, 1958-59). Editor, *Journal of Abnormal and Social Psychology* (1950-55) Author of *Intelligence and Experience, Assessment in Infancy Ordinal Scales of Psychological Development,* and other books

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Professor Emeritus of Entomology, Washington State University Past President, Washington State Entomological Society Coauthor of *Herms' Medical Entomology*

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Biographer Lecturer, Harvard University (1969-70, 1972-73) Senior Editor, Simon & Schuster, Inc (1954-59) Awarded Pulitzer Prize for Biography (1967) Author of *Lincoln Steffens, A Biography, Mark Twain and His World,* and *Mr Clemens and Mark Twain*

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Late Professor and Chairman, Department of Political Science, Washington University Professor of Political Science, University of Colorado Head of the Colorado Legislative Reference Bureau Author of *Privileges and Immunities of Citizens of the United States* and *Citizenship of the American Indians.* Coauthor of *The American People and Their Government*

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Professor of Music, University of York Composer Author of *Caliban Reborn* and other books and articles

Menninger, William C., M.D., D.SC., D LITT., LL.D
Late President and Senior Psychiatrist, Menninger Foundation, Topeka, Kans Member, Board of Regents, The American College of Physicians Consultant in Neuropsychiatry to the Surgeon General, U S Army Member, Expert Advisory Panel, World Health Organization President, American Psychiatric Association (1948-49) American Psychoanalytic Association (1947-49) Author of *Psychiatry in a Troubled World*

Meritt, Lucy Shoe, B.A., M.A., PH D, L.H D
Member, Institute for Advanced Study, Princeton, N J (1948-49, 1950-73) Member, Managing Committee, Executive Committee, and Chairman, Publications Committee (1950-72), American School of Classical Studies, Athens, Greece Associate Professor of Archeology and Greek, Mount Holyoke College (1937-50) Author of *Profiles of Greek Mouldings, Profiles of Western Greek Mouldings, Etruscan and Republican Roman Architectural Mouldings,* and other writings

Metcalf, Keyes D., A.B., LITT.D., L.H.D., LL.D.
Librarian Emeritus, former Director (1937-55), Harvard University Library Consultant in Library Administration and Building Planning Library Consultant in the British Isles, Asia, Africa, Australia, South America, and Europe Professor of Bibliography, Harvard University (1945-55) President, American Library Association (1942-43)

Metzger, Walter P., PH.D
Professor of History, Columbia University Author of *Academic Freedom in the Age of the University* and other books

Meyer, Joachim-Ernst, M D
Professor of Psychiatry and Director, Department of Psychiatry, University of Gottingen

Miller, E. Willard, M.A., PH D.
Professor of Geography and Associate Dean, College of Earth and Mineral Sciences, Pennsylvania State University President, American Society of Professional Geographers (1949) Author of *A Geography of Manufacturing, The Energy Resources of the United States, The Mineral Resources of the United States,* and *A Geography of Industrial Localization*

Milliken, William M., A.B, M F.A., D F.A., L.H D
Director Emeritus, Cleveland Museum of Art Specialist in Medieval Art President, American Association of Museums (1953-57), Association of Art Museum Directors (1946-49) Member, U S National Commission for UNESCO (1953-57) Member, Council of the Medieval Academy of America (1952-55)

Milner, Reid T., B.S., M.S., PH D
Emeritus Head of the Department of Food Science, University of Illinois Director, Northern Regional Research Laboratory, U S Department of Agriculture (1948-54) President, Institute of Food Technologists (1973-74) President, American Oil Chemists Society (1947) Author of articles on agricultural chemistry in professional journals

Mises, Ludwig Edler von
Late Economist and Author Visiting Professor, New York University (1945-69) Professor, Graduate Institute of International Studies, University of Geneva, Switzerland (1934-40), and Vienna University (1913-38) Author of *The Theory of Money and Credit, Bureaucracy, Human Action, a Treatise on Economics, Planning for Freedom,* and other books and articles

Moore, Carl V., A.B, PH D., M D
Late Busch Professor of Medicine and Chairman, Department of Medicine, Washington University

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Former Secretary, General Council of the General Assembly of the Presbyterian Church in the U S A Member, General Board of the National Council of Churches of Christ in America, Executive Committee of the World Presbyterian Alliance Consultant to the World Council of Churches (1954) Member, Presbyterian Foreign Missions Commission to the Philippines and Thailand (1946)

Morgan, Herbert R., B.A., M.A., M.D
Professor of Microbiology, Associate Professor of Medicine, and Head, Department of Microbiology, Rochester School of Medicine and Dentistry Director, Bacteriological Laboratory, Strong Memorial Hospital, Rochester. Director, Rochester Health Bureau Laboratories (1950-59) Author of *Bacterial and Mycotic Diseases of Man, Virus Virulence and Pathogenicity.*

Morgan, William J., B.S., M.A., PH.D
Head, Historical Research Branch, Naval Historical Center, U S Navy Department Commander, U S N R Author of *Captains to the Northward The New England Captains in the Continental Navy* Coauthor of *Civil War Naval Chronology* Editor, *Naval Documents of the American Revolution*

Morley, Felix, A.B., PH.D., D.LITT., LL.D.
Editor, Washington *Post* (1933-40) Washington Correspondent, *Barron's Weekly* (1950-54) President and Editor, Human Events, Inc (1945-50) President, Haverford College (1940-45) Recipient of the 1936 Pulitzer Prize for editorial writing Author of *The Society of Nations, The Power in the People, The Foreign Policy of the United States, Freedom and Federalism, Gumption Island,* and other books

Morris, Craig, B.A., M.A., PH.D
Assistant Curator of Anthropology, American Museum of Natural History

Morton, Newton E., B.A., M.S., PH.D
Professor and Director, Population Genetics Laboratory, University of Hawaii Associate Editor, *American Journal of Human Genetics, Clinical Genetics* Editorial Board, *Behavior Genetics, Human Biology*

Moseman, Albert Henry, B.S., M.S., PH.D
Consultant in Agricultural Sciences, The Rockefeller Foundation, World Bank, and USAID

Motz, Lloyd, B.S., PH.D.
Professor of Astronomy, Columbia University Governor and President (1970), New York Academy of Sciences Author of *Essentials of Astronomy, World of the Atom, Astrophysics and Stellar Structure, The Universe How it Began, How it Will End,* and other books

Mowrer, O. Hobart, A.B., PH.D.
Research Professor of Psychology, University of Illinois President, American Psychological Foundation (1959-60) Fellow, American Psychological Association (President, 1954). Author of *The Crisis in Psychiatry and Religion, The New Group Therapy, Learning Theory and the Symbolic Processes,* and *Morality and Mental Health*

Müller, Paul, PH.D
Recipient of the 1948 Nobel Prize in Physiology and Medicine for the development of DDT Late Vice-Director, J R Geigy A.G (experimental laboratory), Basel, Switzerland. Honorary Member, Swiss Society of Natural Science

Mulliken, Robert S., B.S., PH.D., SC.D.
Recipient of Nobel Prize in Chemistry for 1966 Distinguished Service Professor of Physics and Chemistry, University of Chicago

Murphy, Arthur E., A.B., PH.D.
Late Professor and Executive Officer, Department of Philosophy, University of Washington Fellow, American Academy of Arts and Sciences Editor, *The Philosophical Review* (1949-53) Professor of Philosophy, Cornell University (1945-53), University of Illinois (1939-45) Author of *The Uses of Reason* Contributor to *The Philosophy of John Dewey*

Nelson, Rev. Reuben E., A.B., B.D., S.T.M., D.D.
Late General Secretary, American Baptist Convention Member, General Board of the National Council of Churches of Christ in America Member of Central Committee and Delegate of American Baptist Convention to the World Council of Churches Member, Board of Overseers, Harvard Divinity School

Neville, Harvey A., A.B., M.A., PH.D., LL.D.
President Emeritus, former Director, Institute of Research, Professor and Head, Department of Chemistry and Chemical Engineering (1938-52), and Dean, Graduate School (1949-56), Lehigh University Fellow, American Institute of Chemists

Nevins, Allan, A.B., A.M., LITT.D., LL.D., L.H.D
Late Chairman, Advisory Board, *American Heritage* Senior Research Associate, Huntington Library (1958-69) Professor of American History, Columbia University (1931-58) Professor of American History, Cornell University (1927-28) President, American Historical Association, Society of American Historians, American Academy of Arts and Letters Recipient of Pulitzer Prizes for Biography (1933, 1937) Author of *The Emergence of Lincoln* and other books

Newman, Evelyn, B.A., M.DIV.
Pastoral Minister of Riverside Church Former Assistant Pastor of the Smithtown United Methodist Church Past Minister of Adult Education of the Christ Church United Methodist

Nichols, Robert L., B.S., M.A., D.SC., PH.D.
Professor Emeritus of Geology, Tufts University and Eastern Kentucky University Member, U S Geological Survey Geologist with numerous expeditions.

Niebuhr, Rev. Reinhold, M.A., D.D., LL.D., LITT.D., S.T.D.
Late Professor of Ethics, Union Theological Seminary Member, American Academy of Arts and Letters Former Editor, *Christianity and Crisis.* Author of *Moral Man and Immoral Society, The Structure of Nations and Empires, The Irony of American History, The Children of Light and the Children of Darkness,* and other books

Northrop, John H., B.S., M.A., PH.D., D.SC., LL.D.
Shared the Nobel Prize in Chemistry in 1946 Professor Emeritus, Rockefeller University. Professor Emeritus of Bacteriology and Biophysics, University of California Honorary Editor, *Journal of General Physiology* Coauthor of *Crystalline Enzymes*

Ochsner, Alton, B.A., M.D., D.SC., LL.D
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ciety for Vascular Surgery, Société Internationale de Chirurgie, and American Cancer Society Author of *Smoking Your Choice Between Life and Death*

Oliver, Douglas L., A.B., PH.D
Professor Emeritus of Anthropology, Harvard University Professor of Pacific Islands Anthropology, University of Hawaii Consultant, U S Department of State (1948-50) Special Representative to the Pacific Area, Foreign Economic Administration (1943-46) Author of *Studies in Anthropology in Bougainville, The Pacific Islands, Invitation to Anthropology, Bougainville A Personal History,* and other books

Oliver, James A., A.B, A.M., PH D
Director, New York Aquarium Former Coordinator of Scientific and Environmental Programs (1969-70) Director Emeritus of the American Museum of Natural History, New York City. Former Director and Curator of Reptiles, New York Zoological Society Assistant Professor of Biology, University of Florida (1948-51) Associate Curator, American Museum of Natural History, New York (1942-48) Author of *The Natural History of North American Amphibians and Reptiles* and *Snakes in Fact and Fiction*

O'Malley, C. D., PH D
Late Professor of Medical History, University of California Medical Center Author of *Leonardo da Vinci on the Human Body, Andreas Vesalius of Brussels,* and other books

Overton, Richard C., A.B., A.M., PH.D
Teacher of History, Burr & Burton Seminary Professor of U S History, University of Western Ontario (1961-73) Professor of U S History, Institute of American Studies, Williams College (1956-58) Professor of Business History, Northwestern University (1945-55) Consultant for various railways (1949-65) Author of *Burlington West, Gulf to Rockies,* and *Burlington Route*

Packard, Sidney R., A.B., A.M., PH.D., D L, L.H D.
Professor Emeritus of History, Smith College Coordinator of Cooperative Academic Activities, Amherst, Mount Holyoke, and Smith colleges and the University of Massachusetts Consultant, *American College Dictionary* (1947-66) Editor of *Berkshire Studies in European History* and *Smith College Studies in History* Author of *Europe and the Church Under Innocent III* and *Twelfth Century Europe*

Palmer, E. Laurence, B.A., M.A., PH.D.
Late Professor of Nature Study and Conservation Education, Cornell University Director, Nature Education, *Nature* magazine (1925-59) Director, Conservation Education, National Wildlife Federation (1950-56) Editor, *Cornell Rural School Leaflet* (1919-52) Author of *Fieldbook of Natural History* and *Palmer's Fieldbook of Mammals*

Palmer, George D., Jr., B.S., M.A., PH.D
Professor Emeritus of Organic Chemistry, University of Alabama Founder and past President, Southern Association of Science and Industry Initiated founding of Southern Research Institute at Birmingham President, Alabama Academy of Science (1939) Author of *Introduction to Organic Chemistry* and *The Inside of the Atom*

Parr, Albert E., D.SC.
Director Emeritus, American Museum of Natural History, New York City Director, Peabody Museum, Yale University (1938-42) Contributor of articles on marine research, museology, and urbanology to professional journals

Payne-Gaposchkin, Cecilia, B.A., M.A., PH D., SC.D
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Late Professor Emeritus of Romance Philology, Columbia University Associate Editor, *Romanic Review* Former Consultant and Broadcaster for the Office of War Information, Voice of America, Radio Free Europe Author of *The Story of Language, The Story of the English Language, All About Language, The World's Chief Languages, The Many Hues of English,* and *Language Today*

Perlman, Alfred Edward, S.B., D.SC., LL.B
President, Western Pacific Railroad Chairman, Eastern Railroad Presidents Conference (1965-70) Vice-Chairman, Penn Central Transportation Company (1969-70) President, New York Central System (1954-68) Chairman, Visiting Committee, Department of Civil Engineering, Massachusetts Institute of Technology Headed American delegations at International Symposiums on Railway Cybernetics in Paris (1963), Montréal (1967), and Tokyo (1970)

Pickett, B. S., B.S., M.S., PH D
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Late Professor of Physical Medicine and Rehabilitation, School of Medicine, University of Pennsylvania Professor of Medicine and Dean, Graduate School of Medicine, University of Pennsylvania Area Consultant, U S Veterans Administration President, American College of Physicians (1933) Editor of *Cyclopedia of Medicine* and *Surgery and the Specialties*

Piston, Walter, A.B., MUS.D., D.F.A.
Professor of Music, Emeritus, Harvard University Recipient of Pulitzer Prize in Music in 1948 and 1961 Author of *Harmonic Analysis* and other books

Pomeroy, John H., B.S., M.S., PH D.
Executive Secretary, Committee on Radioactive Waste Management, National Academy of Sciences Assistant Director, Lunar Sample Program, Apollo Lunar Exploration Office, NASA (1970-75)

Pomeroy, Wardell B., A.B., M.A., PH.D
Member, Cornell Medical College Faculty, Department of Psychiatry, American Institute of Psychotherapy and Psychoanalysis Past Director of Field Research, Institute for Sex Research Author of *Your Child and Sex* and other books

Porter, Bennet A., B.S., PH.D
Former Chief, Fruit Insects Research Branch, Entomology Research Division, Agricultural Research Service, U S Department of Agriculture President, Entomological Society of America (1956) Author of articles on fruit insects in professional journals

Potofsky, Jacob S., L.H.D., D.C.S., LL.D
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Potter, Norris W., A.B., A.M., PH.D
Rear Admiral, U S N R (ret) Associate Professor, Northeastern University (1930-41) Coauthor of *Hawaii—Our Island State, One Nation Indivisible,* and other books

Quarles, Benjamin, A.B., A.M., PH.D., LITT.D., L.H.D.
Professor Emeritus of History, Morgan State College Author of *Black Abolitionists* and other books

Raynor, Rev. John P., S.J., B.A., M.A., PH.D., LL.D
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Ernest I White Professor of American Studies and Humane Letters, Cornell University Special Consultant, former Director, Division of Research and Publications, National Endowment for the Humanities Former Professor of American Studies and History, George Washington University Author of *They Came in Chains, On Being Negro in America,* and other books

Reichelderfer, Francis W., A.B., D.SC.
President, World Meteorological Organization (1951-55) Director, U S Weather Bureau (1938-64) Member, Executive Committee, International Geophysical Year (1954-64) Vice-Chairman, Executive Committee, National Advisory Committee on Aeronautics (1945-60) President, Meteorological Section, American Geophysical Union (1944-47) Consultant to international meteorological organizations

Reischauer, Edwin O., B.A., M.A., PH.D., LL.D
University Professor, Harvard University United States Ambassador to Japan (1961-66) Author of *Japan The Story of a Nation, Wanted An Asian Policy, Beyond Vietnam The United States and Asia, Toward the 21st Century, Education for a Changing World,* and other books Coauthor, *East Asia Tradition and Transformation*

Reuther, Walter P., LL.D., L.H.D
Late President, International Union, United Automobile, Aerospace and Agricultural Implement Workers of America Board Member, International Confederation of Free Trade Unions Member, President's Advisory Committee on Defense Mobilization Vice-President, American Federation of Labor-Congress of Industrial Organizations (1955-68) President, Congress of Industrial Organizations (1952-56)

Rich, Linvil G., B.S., M.S., PH.D
Professor of Environmental Systems Engineering, Clemson University Consultant, EPA and U S Army Author of *Unit Operations of Sanitary Engineering, Unit Processes of Sanitary Engineering,* and *Environmental Systems Engineering*

Richmond, Alfred C., B.S., J.D
Admiral and Commandant (ret), U S Coast Guard

Ridgway, General Matthew Bunker, U.S.A. (RET), B.S., D.M.S., LL.D
Supreme Commander for Allied Powers, Commander in Chief, United Nations Command in Far East, and Commander in Chief, Far East Command (1951-52) Chief of Staff, U S Army (1953-55) Supreme Commander, Allied Powers, Europe (1952-53) Author of *Soldier* and *The Korean War*

Rinkenbach, William H., A.B., M.S.
Late Consulting Chemist and Inventor of Explosives Chief Chemist, Picatinny Arsenal, U S Department of the Army (1927-48) Explosives Research Chemist, U S Bureau of Mines (1919-27) Author of papers on explosives and organic chemistry in professional journals

Robinson, C. Paul, B.S., PH.D
Technical Director, Laser Isotope Separation, Los Alamos Scientific Laboratory Former Chief Test Operator, Nuclear Reactor Tests, Nevada Test Site

Robinson, Jerry
Creator, *still life* and *Flubs & Fluffs,* Chicago *Tribune*-New York *News* Syndicate features Director, Association of American Editorial Cartoonists (1975) President, National Cartoonists Society (1967-69). Author of *The Comics An Illustrated History of Comic Strip Art* and other books

Robinson, J. Lewis, M.A., PH.D.
Professor of Geography, University of British Columbia Geographical consultant. Author of *The Geography of Canada* and *Resources of the Canadian Shield*

Roche, Jean, M.D., SC.D., D C.L
Rector and Professor of Biochemistry, Collège de France General Delegate of the Minister of Education to International Affairs of Universities

Rostow, W W., A.B., PH.D
Professor of Economics and of History, University of Texas at Austin Special Assistant to the President for National Security Affairs (1966-69) Author of *The Process of Economic Growth, The Diffusion of Power,* and other books

Rothfels, Hans, PH.D
Professor Emeritus of Modern History, University of Tübingen Professor of Modern History, University of Chicago

(1946-55) Professor, Brown University (1940-46) Research Fellow, St John's College, Oxford University (1939-40) Professor of History, University of Konigsberg (1926-36) Author of *The German Opposition to Hitler* and other books Editor, *Vierteljehshefte fur Zeitgeschichte*

Runciman, Sir Steven, M.A., PH D., D LITT, LL.D, D D, D H.L
Honorary Fellow, Trinity College, University of Cambridge Professor of Byzantine Art and History, Istanbul University (1942-45) Author of *Byzantine Civilisation, History of the Crusades, The Fall of Constantinople,* and other books

Rutherford, Paul, B.A., M.A., PH D
Associate Professor of History, University of Toronto Associate Editor, *Canadian Historical Review* Editor, *Saving the Canadian City The First Phase 1880-1920*

Ryan, Rev. Edward Anthony, S J, PH D., S.T.D, DR. EN SCS HIST
Late Professor of Church History and Dean of the Faculty of Theology, Woodstock College Author of *The Historical Scholarship of St Bellarmine* and *Pages from the Story of an Ancient Parish*

Sachs, Curt, B.A., PH D., D.H.L.
Late Adjunct Professor of Musicology, Columbia University Visiting Professor and Lecturer in Musicology, New York University (1937-57) Consultant, New York Public Library (1937-52) President, American Musicological Society (1948-50) Honorary President, American Ethnomusicological Society Author of *History of Musical Instruments, Rise of Music in the Ancient World,* and *Our Musical Heritage*

Saffron, Morris Harold, A.B., M.A., PH.D., M.D.
Lecturer in the History of Medicine, Rutgers Medical School Former President, Academy of Medicine of New Jersey Archivist and Historian, Medical Society of New Jersey Fellow, American Medical Association, Medieval Academy of America, and History of Science Society

Salisbury, Harrison E., B.A.
Associate Editor and Foreign Correspondent, New York *Times* Recipient of the 1955 Pulitzer Prize for International Affairs Reporting Correspondent and Foreign News Editor, United Press (1930-48) Author of *Moscow Journal, A New Russia, Russia, The 900 Days The Siege of Leningrad,* and *War Between Russia and China*

Sandmel, Samuel, A.B., B.H.L., PH D.
Distinguished Service Professor of Bible and Hellenistic Literature, Chairman, Executive Committee, Frank Weil Institute of Religion and Humanities, Director of Graduate Studies, Provost (1957-66), Hebrew Union College-Jewish Institute of Religion Author of *Hebrew Scriptures, We Jews and Jesus, Herod Profile of a Tyrant,* and other books

Sansom, Sir George, G.B.E., K.C.M.G., LL.D.
Late Consultant Professor, Hoover Library, Stanford University Professor of Japanese and Director of the East Asian Institute, Columbia University (1947-53) Minister, British Embassy, Washington, D C (1942-47) British Diplomat in Japan (1904-40) Author of *Japan, A Short Cultural History, The Western World and Japan,* and *History of Japan*

Saville, Thorndike, B.A., B.S., M.S., C.E., D.ENG., SC.D
Late Professor of Hydraulic and Sanitary Engineering and Dean of the College of Engineering, New York University Council Member, American Association for the Advancement of Science (1951-53) President, American Society for Engineering Education (1949-50) Director, American Society of Civil Engineers (1945-48)

Schneirla, T. C., A.B., M.S., SC.D
Late Curator, Department of Animal Behavior, American Museum of Natural History, New York City Adjunct Professor of Psychology, Graduate School of Arts and Sciences, New York University Author of *Learning and Orientation in Ants* Coauthor of *Principles of Animal Psychology* and *Recent Experiments in Psychology*

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Holder of the Joseph M Proskauer Chair in Law and Social Welfare, Florence Heller School for Advanced Studies in Social Welfare, Brandeis University Former Commissioner of Social Security, U S Department of Health, Education, and Welfare President, National Association of Social Workers (1967) President, International Conference on Social Welfare (1968) Author of *The Social Security Program in the United States* Editor, *The Welfare State*

Schultz, Leonard P., B.A., M.S., PH.D
Zoologist Emeritus, Smithsonian Institution Member, Shark Research Panel, American Institute of Biological Sciences Member, Board of Governors, American Society of Ichthyologists and Herpetologists Recipient of the Trophy Award, International Federation of Aquarium Societies Coauthor of *The Ways of Fishes, Handbook of Tropical Aquarium Fishes,* and *The Wondrous World of Fishes*

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University Professor of Chemistry, University of California at Berkeley Chairman, U S Atomic Energy Commission (1961-71) Recipient of the Atomic Energy Commission's 1959 Enrico Fermi Award Corecipient of the 1951 Nobel Prize in Chemistry Author of *The Transuranium Elements* Coauthor of *Elements of the Universe* and *The Nuclear Properties of the Heavy Elements*

Sender, Ramón José
Writer in Residence, University of Southern California Former Professor of Spanish Literature, Amherst College Visiting Professor, University of Southern California (1965) Professor of Spanish Literature, University of New Mexico

(1947-63) Author of *The Sphere, The Affable Hangman, Before Noon, Requiem for a Spanish Peasant, Exemplary Novels of Cibola,* and other books

Senn, Milton J.E., B.S., M.D.
Former Professor of Pediatrics and Psychiatry and Director of the Child Study Center, Yale University Member, Editorial Board, *Pediatrics* (1951-57) President, American Psychosomatic Society (1950-51) Author of *All About Feeding Children, The First-Born,* and *Problems in Child Behavior and Development*

Shuster, George N., PH D., LL.D., MUS.D., LITT.D., D.L.
Late Trustee and Assistant to the President, University of Notre Dame Former President, Hunter College Member, National Commission for UNESCO Honorary Director, Carnegie Endowment for International Peace, Fund for the Republic, and Institute of International Education Author of *The Ground I Walked On* and other books

Shykind, Edwin B., B.S., M.S., PH.D
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Sidey, Hugh S., B.S.
Chief, Washington Bureau, *Time* magazine Author of *These United States, Portrait of a President, LBJ in the White House,* and other books

Simon, George T., A.B.
Special Consultant, National Academy of Recording Arts and Sciences Board of Advisers, Newport Jazz Festival Past Editor, *Metronome Magazine* Former Jazz Columnist, New York *Herald Tribune* Author of *The Big Bands Song Book* and other books

Singer, James, B.A., M.A., PH.D
Professor Emeritus of Mathematics, Brooklyn College, City University of New York

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Spaeth, Sigmund, A.B., A.M., PH.D.
Late Editor, *Music Journal* Columnist, "Music for Everybody" Radio and Television Panelist President, Louis Braille Institute of America Chairman for Audio-Visual Education, National Federation of Music Clubs President, National Association of American Composers and Conductors (1935-44)

Springer, Otto, PH.D.
Professor of Germanic Languages and Literatures, Dean of the College of Arts and Sciences (1959-68), University of Pennsylvania Member, Advisory Board, *Speculum.* Fellow of Mediaeval Academy of America Vice-President, Linguistic Society of America (1954) Chairman, Department of Germanic Languages and Literature, University of Kansas (1936-40) Author in Germanics, especially medieval German language and literature, Old Norse, and dialect geography

Stamp, Laurence Dudley, C.B.E., B.A., D.SC., D.LITT., LL.D.
Late Professor of Social Geography, London School of Economics, England Chief Adviser on Rural Land Utilization to the British Ministry of Agriculture (1942-55) President, International Geographical Union (1952-56), Institute of British Geographers (1956), and Section E, British Association for the Advancement of Science (1949)

Stanley, Wendell M., B.S., M.S., PH.D., SC.D., LL.D.
Late Professor of Biochemistry and Molecular Biology, University of California at Berkeley Member, Panel on Virus Diseases, World Health Organization Recipient of the National Award, American Cancer Society (1963) Director-at-Large, American Cancer Society (1955-61). Chairman, Board of Scientific Counselors, National Cancer Institute (1957-58) Recipient of the Nobel Prize in Chemistry (1946)

Stefánsson, Vilhjálmur, A.B., A.M., PH.D., LL.D.
Late Arctic Explorer Arctic Consultant, Department of Northern Studies, Dartmouth College Commander, Canadian Arctic Expedition (1913-18) Member of archeological and ethnological expeditions to the Eskimo of Mackenzie Delta, Iceland, the North Coast of Alaska, and Cape Parry (1905-12) Author of *Arctic Manual, Greenland, My Life with the Eskimo,* and other books on exploration.

Sterling, J. E. Wallace, A.B., A.M., PH.D., LL.D., D.C.L., LITT.D., D.H.L.
Chancellor, Stanford University Member, Advisory Board, Office of Naval Research, Board of Visitors, U S Naval Academy, and Ford Motor Company Scholarship Board Trustee and former Director, Huntington Library and Art Gallery Professor of History and Government and Chairman of the Faculty, California Institute of Technology (1942-46)

Stevenson, John A., B.S.
Collaborator, Mycology Investigations, Crops Research Division, Agricultural Research Service, U S Department of Agriculture Research Associate, Smithsonian Institution President, Botanical Society of Washington (1957) and Mycological Society of America (1947) Author of *Manual of Foreign Plant Diseases*

Storke, Lieutenant General Harry Purnell, U.S.A.(RET.), B.S., LL.D., LITT.D., D.ENG
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Stowe, Rev. Walter H., B.A., B.D., S.T.D
Former Historiographer of the American Episcopal Church and of the Diocese of New Jersey Editor-in-Chief, *Historical Magazine of the Episcopal Church* President and Editor, Church Historical Soci-

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ety Rector, Christ Church, New Brunswick, N J , and Honorary Canon, Trinity Cathedral, Trenton, N J Author of *Life and Letters of Bishop William White*

Strasberg, Lee
Artistic Director, The Actor's Studio, Inc Creator, Lee Strasberg Institute of Theatre, New York, Los Angeles Cofounder and Director of Group Theatre, 1930-37 Staged Pulitzer Prize winning play *Men in White* (1933-34) Guest Lecturer, Harvard, Yale, Brown, Brandeis, and Northwestern universities

Sweeney, James Johnson, A.B
Art Adviser, Israel Museum, Jerusalem, Israel Consultant Director, Museum of Fine Arts, Houston, Texas Former President, International Association of Art Critics Former Advisory Editor, *Partisan Review* Member, Advisory Committees, The Arts Center Program, Columbia University, Art Education Department, New York University, Bennington College Author of *Alexander Calder, Stuart Davis, Marc Chagall, Henry Moore, Irish Illuminated Manuscripts, African Negro Art, Pierre Soulages,* and other books

Sylvestre, Jean Guy, B.A., L.PH., M.A., D LS
National Librarian of the National Library, Ottawa, Canada Honorary Librarian, Royal Society of Canada Author of *Poètes Catholiques de la France Contemporaine, Jules Laforgue, Sondages, Impressions de Théâtre, Panorama des Lettres Canadiennes-Françaises, Un Siècle de Littérature,* and other books

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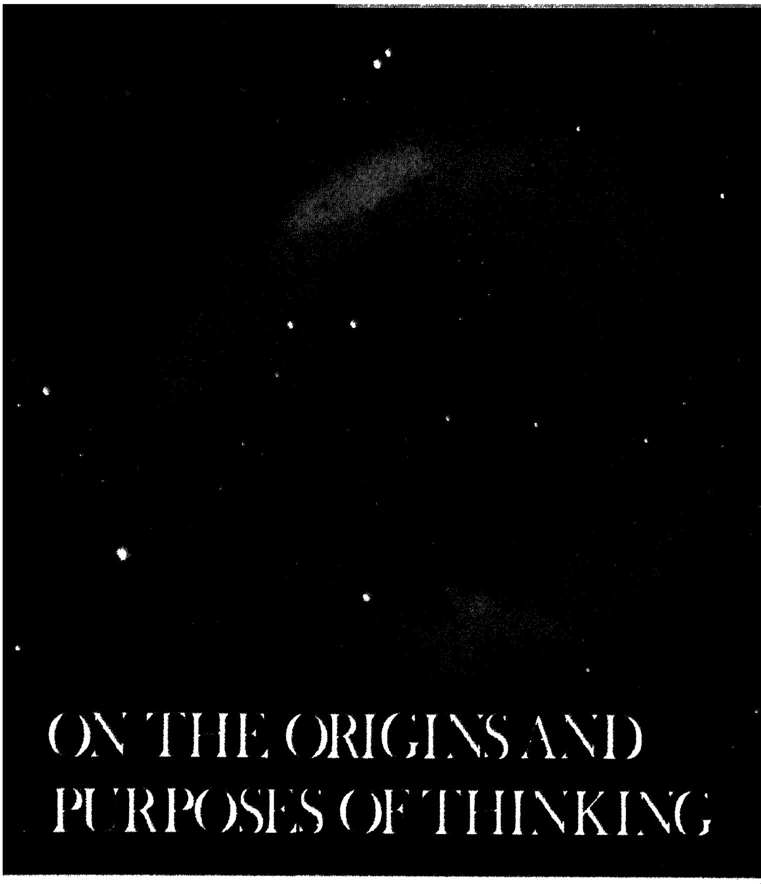
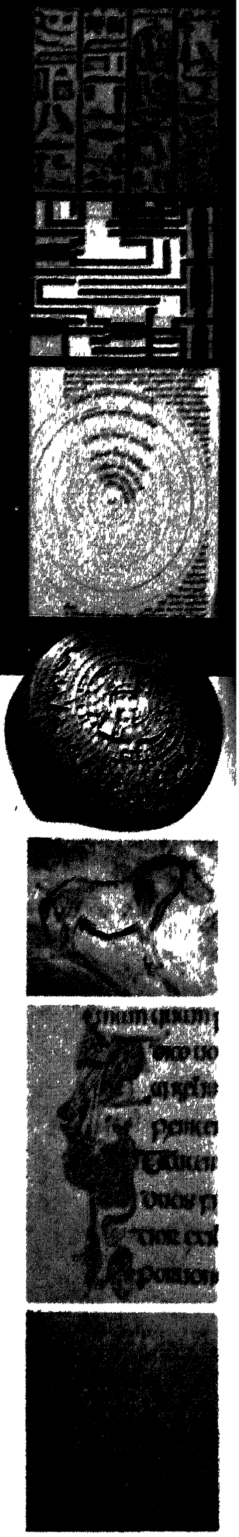
On the Origins and Purposes of Thinking
Art and Design: Ronald Keller
Page 49 (top) © California Institute of Technology and the Carnegie Institution of Washington, (right, top to bottom) Tom McHugh–Photo Researchers, George Holton–Photo Researchers, Shostol, IBM, R Rowan–Photo Researchers, The Granger Collection, European Art Color Slides **Page 50** (top) European Art Color Slides **Page 51** (top) Scala, (center, left to right) UPI, United Nations, UPI **Page 52** (top left) Greek National Tourist Office, (bottom left) The Granger Collection, (right) Lawrence Smith–Photo Researchers **Page 53** European Art Color Slides **Page 54** Bettmann Archive **Page 55** Bettmann Archive **Page 56** European Art Color Slides **Page 58** N Y Knicks **Page 60** Bettmann Archive **Page 61** Katherine H Jensen **Pages 62–63** (left to right) NASA, Peter Arnold, UPI, A Devaney, Inc, Peter Arnold, UPI; European Art Color Slides, Pfizer Co **Page 64** Bettmann Archive



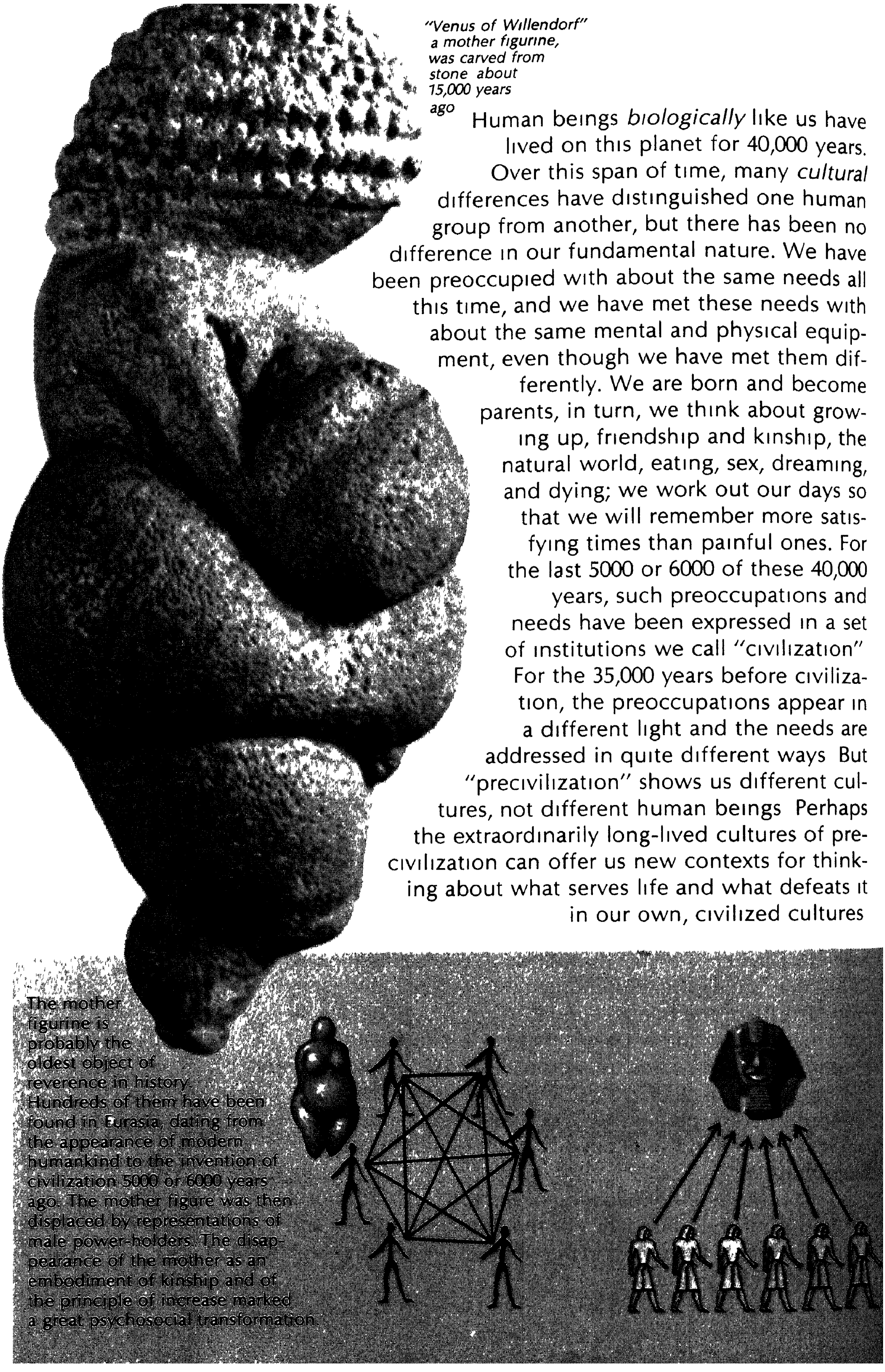
ON THE ORIGINS AND PURPOSES OF THINKING



Let us imagine a very large screen in a dark theater. We enter this theater and see nothing In order to see images playing over the screen's surface, we must bring in a projector of our own and shine its light on the screen in front of us.

Our screen displays the whole of the human condition—what men and women have thought and felt and done over thousands of years and in every part of the world. The projector is the thinking mind We do not really know how large this screen is or just how it might fully be illuminated. We sense that seeing the entire screen, knowing what the length and breadth of the human condition are, would be deeply important to us. And we sense that our having a source of illumination that could cast a broad light over all of the screen so that we might see it whole, and at the same time focus intensely on any part of the screen we choose—that so achieving the mind's full powers would be comparably important.

Our purpose in the following pages will be to attempt a definition of the boundaries of the human condition and to map some of the uses and possibilities of the fully comprehending mind



"Venus of Willendorf" a mother figurine, was carved from stone about 15,000 years ago

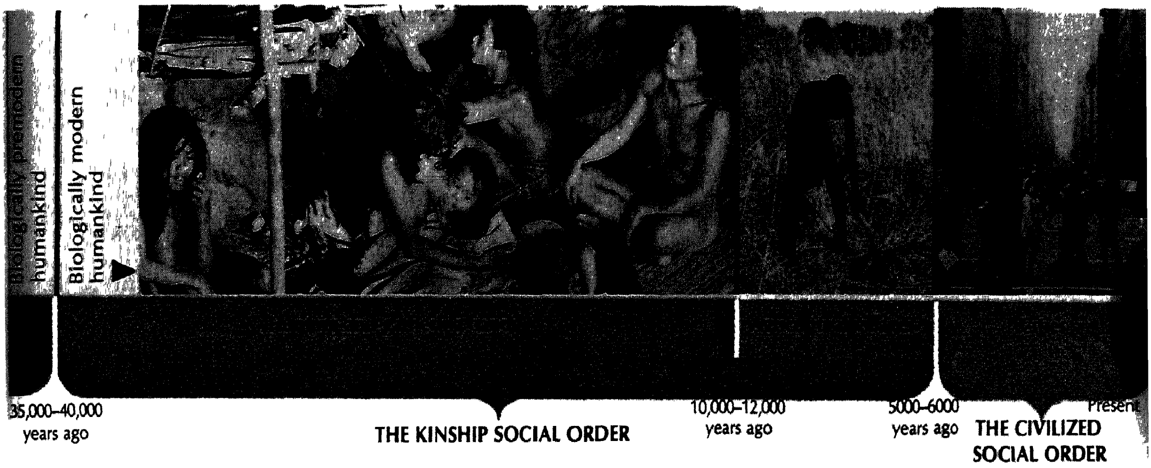
Human beings *biologically* like us have lived on this planet for 40,000 years. Over this span of time, many *cultural* differences have distinguished one human group from another, but there has been no difference in our fundamental nature. We have been preoccupied with about the same needs all this time, and we have met these needs with about the same mental and physical equipment, even though we have met them differently. We are born and become parents, in turn, we think about growing up, friendship and kinship, the natural world, eating, sex, dreaming, and dying; we work out our days so that we will remember more satisfying times than painful ones. For the last 5000 or 6000 of these 40,000 years, such preoccupations and needs have been expressed in a set of institutions we call "civilization" For the 35,000 years before civilization, the preoccupations appear in a different light and the needs are addressed in quite different ways But "precivilization" shows us different cultures, not different human beings Perhaps the extraordinarily long-lived cultures of precivilization can offer us new contexts for thinking about what serves life and what defeats it in our own, civilized cultures

The mother figurine is probably the oldest object of reverence in history. Hundreds of them have been found in Eurasia, dating from the appearance of modern humankind to the invention of civilization 5000 or 6000 years ago. The mother figure was then displaced by representations of male power-holders. The disappearance of the mother as an embodiment of kinship and of the principle of increase marked a great psychosocial transformation.

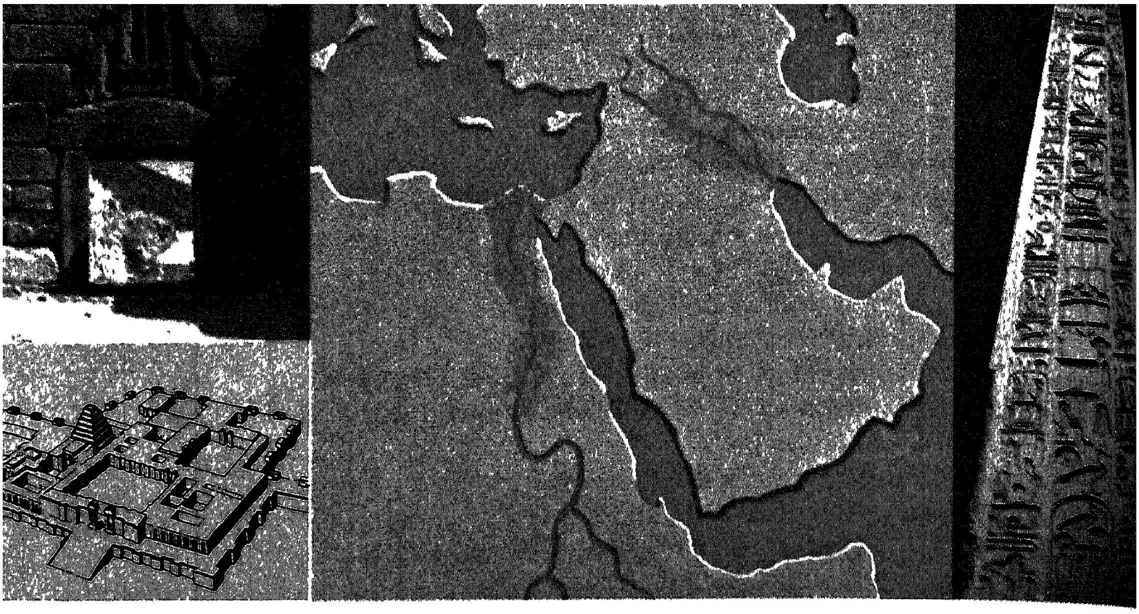
Probably the most important context for thinking about civilization is a historical and philosophical one· What is the "fundamental nature" of humankind? Here the longevity of precivilization will help us The basic arrangements of life during these 35,000 years must represent something close to that fundamental nature. Surely life in precivilized times was a mixed and complex enterprise, as it is now, but we can pick out themes and emphases in that mixed condition that differ from our own.

Bronze head of Sargon of Akkad (about 2270–2215 BC), one of the first rulers to proclaim himself a king

Precivilized communities appear to have been founded on kinship and the principle of increase Persons defined themselves not as citizens of nations or participants in professions or religions, but as members of kin-groups Kinship reciprocity and generosity held precivilized groups together, and concentration on fertility and growth tied groups to the earth Social, political, and economic institutions, relationships to nature, and such central creative traditions as myth, poetry, and ritual all tended to show kinship and reciprocity, increase and fertility as great themes. Consequently, we can take this thematic cluster as a historical and philosophical context for examining our own time, where another cluster predominates



The first biologically modern human beings lived in small bands of roving, hunting-and-gathering kin-groups. After 30,000 years with the invention of agriculture by the women of the bands, the earliest farming villages appeared, and humankind settled down. Precivilized villagers remained kinship-organized and peace-preserving for 5000 years. The ways in which group decisions were made, the necessities of life exchanged, and collective expressiveness encouraged—all served the objectives of village amity.



Above left The Lion Gate (about 1400 B.C) was the entrance to the citadel of Mycenae. Below left A reconstruction of the citadel of Sargon II built between 742 and 706 BC at Dur Sharrukin (now Khorsabad) Center Map of the Middle East showing the Fertile Crescent between the Tigris and Euphrates rivers Right Obelisk of Thutmose I (about 1500 BC) at the temple of Amon in El Karnak, Egypt

The origins of our own ways of making group decisions, exchanging necessities, and otherwise expressing ourselves can be located with some certainty We were formed about 5500 years ago in the southern plain of the Tigris and Euphrates rivers. There the first cities in human history grew up. They transformed the men and women who lived in them. We come in a direct line from these people

Let us assume that a "language of peace-preservation" had functioned at the deepest level of earlier band and village life. Such a language would not have possessed an elaborate apparatus for intervention and control in the affairs of persons or the processes of nature, its complexity would have lain elsewhere, in fine discriminations of kinship and in expressions of the principle of increase It is of the utmost importance to understand that the earliest cities were nearly always at war with one another and in internal turmoil This kind of violence has its language as well, a language precisely of intervention and control. The actual structures of speaking and thought changed in the chronically violent cities, slowly arming the cities' managers with the tools for organizing both persons and nature in unprecedented ways. The new linguistic instruments virtually forced relationships between persons into the pattern of win-loss contests. Civilized contests are often subtle, and they are often entered voluntarily, but they usually tend to a simple and less-than-humane outcome One contestant wins and the other loses Connections with nature came to show the same contestual features, until we can speak of "defeating" a mountain and "conquering" space. In more and more instances, contest replaced both kinship and increase as the basis of social relationships and relationships to nature.

The longest tradition of a language of control may be found in the law. Precivilization, without a language of control, and ordered by the unchanging custom of kinship obligation, required no legal systems. We must look at why laws became necessary in civilizations and at how they were made. What most strongly differentiates the city, where civilized institutions are strongest, from the band or village is that kinship obligations are shattered by the city's managers and replaced by obligations to those managers The new loyalty is to a stranger, and for that reason alone it must often be enforced coercively. It is advantageous to civilizations to create whole populations of strangers, both to make the new loyalty appear less strange and further to dissolve kinship bonds.

The city wishes to administer its directives without lapse in order to assert its continuing dominion over kinship This raises the problem of equipping a permanent group of administrators They will be busy and among strangers, so they will need easily memorizable rules, applicable quickly and in all circumstances. The first such rules that have been uncovered by archeologists take the following form:

If any person does this thing, anywhere and at any time, that person will be guilty of a crime.

Now a law enforcer sees a particular person doing that very thing, at a particular time and place. He makes the following inference·

I. If anyone does that, anywhere and anytime, he is guilty of a crime.
II. That person over there is doing that.
III. That person is guilty of a crime.

He then arrests him Obvious to us, but when this pattern of thought became institutionalized the human world was decisively changed. In the kinship social order, justice had been in the hands of men and women who knew the wrongdoer. Judgment grew out of years of experience shared by the judges and the judged. The city's judgment, levied quickly and among strangers, depended not upon a mass of concrete details but upon an abstract pattern of inference:

I. A universal statement: *X* is the case everywhere, all the time.
II. A particular statement: This particular *a* is an *X*.
III. The conclusion: This particular *a* is the case.

The stele of Hammurabi shows the king with the sun god, Shamash The code of Hammurabi, inscribed below, is the earliest written body of laws

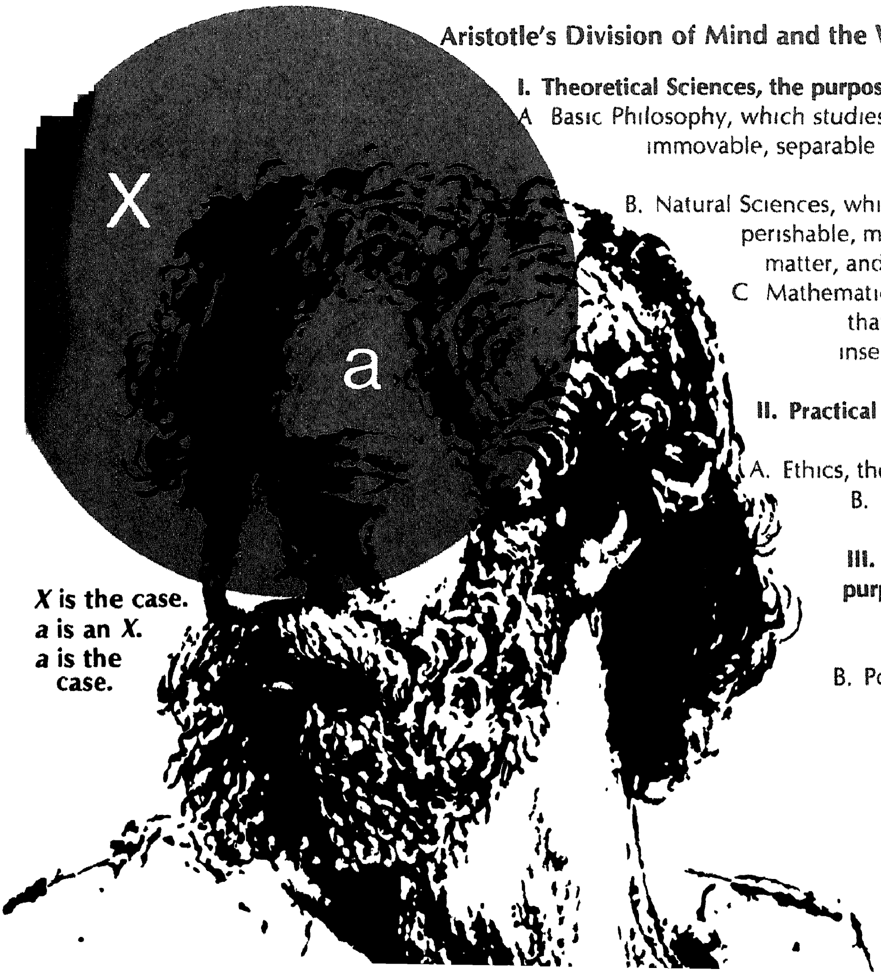
This pattern was probably first raised to eminence 5500 years ago, when city populations had to be ordered in a new way. Twenty-five hundred years ago, the pattern was applied with extraordinary force to nature: In the 6th century B.C., in Greece, modern science was born. Nature was made a stranger in Greece, as neighbors had been made strangers 3000 years before in the Middle East. Abstract operations rendered the estranged world manipulatable, just as persons had been rendered manipulatable 3000 years earlier.

The law and science together became the principal supports of civilized states. Behind them both stood the master pattern.

I. *X* is the case.
II. *a* is an *X*.
III. *a* is the case.

In the 4th century B.C., the Greek philosopher Aristotle gave the perfected form of the master pattern to the West.

One study preceded the division of mind and the world for Aristotle: The first interest of the thinker was to be thought itself



Aristotle's Division of Mind and the World into Three Parts

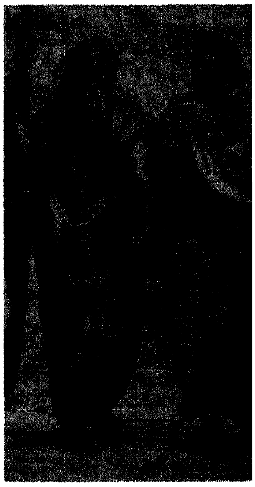
I. Theoretical Sciences, the purpose of which is knowledge
  A. Basic Philosophy, which studies objects that are eternal, immovable, separable from matter, and not accessible to the senses
  B. Natural Sciences, which study objects that are perishable, movable, inseparable from matter, and accessible to the senses
  C. Mathematics, which studies objects that are eternal, immovable, inseparable from matter, and accessible to the senses
II. Practical Sciences, the purpose of which is action
  A. Ethics, the action being individual
  B. Politics, the action being collective
III. Productive Sciences, the purpose of which is artifacts
  A. Rhetoric, the artifacts being speeches
  B. Poetics, the artifacts being poems and plays

***X* is the case.**
***a* is an *X*.**
***a* is the case.**

Aristotle's legacy to the West has been his conception of correct thinking, grounded in two principles.

1. **precision—that a word have one and only one meaning**
2. **order—that a group of *words,* usually making up sentences, must show a correct order or syntax; and that groups of *sentences,* when they are arranged in arguments, must show the correct higher order, the master pattern**

Notice that Aristotle's system comprises a preliminary study and three sciences Each science has a different purpose For Plato, Aristotle's great predecessor, all knowing was to one purpose only, which he called "the good" Plato had expressed a powerful sentiment of unification, Aristotle of division. Since the 4th century B C, thinking persons have oscillated between Plato's One and Aristotle's Many.



Plato and Aristotle, a detail from the "School of Athens" by Raphael

Whatever we might think about putting the natural sciences or politics where Aristotle put them in his system, he made distinctions in exactly the same way we make them. Observe how the objects studied by the theoretical sciences are differentiated from one another Two objects may be accessible to the senses and they may both be "inseparable from matter", but if one object is perishable and the other is eternal, they belong to two different theoretical sciences. This kind of distinction-making effectively separates objects into bins for special study, and it requires us to abstract qualities, like eternality, from objects To the forceful imperatives (1) to make distinctions, and (2) to value abstraction, Aristotle adds the imperative (3) to rank or subordinate. The theoretical sciences, for example, are *better* than the practical sciences for Aristotle, and among the theoretical sciences, basic philosophy is better than the natural sciences and mathematics.

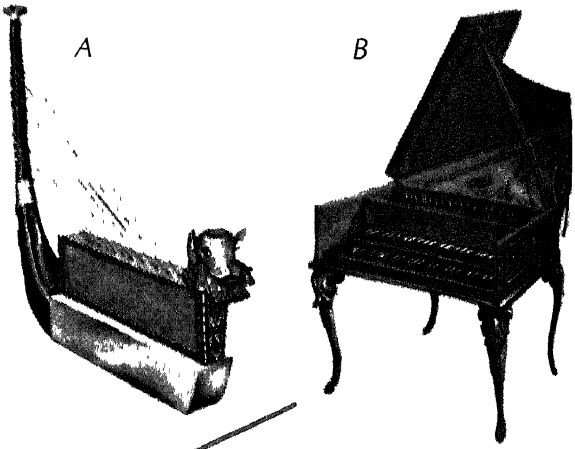
No turn was taken away from precision and order, distinction-making, abstracting, and ranking by Aristotle's successors, even though many other systems-of-the-world followed his. In the 17th century, in England, John Locke, Thomas Hobbes, and Sir Isaac Newton set the modern terms for precise, mathematical sciences of mind, society, and nature By the end of the 19th century, it seemed that mathematical laws would be found for a complete world system, locating mind in society and society in nature. Thus was an uneasy unity restored to Western thought: Ways would continue to be found to separate disciplines in the Aristotelian spirit, but they would be brought together by their Platonic search for universal, mathematical laws. Aristotle would be partially reconciled with Plato. We can see the fruits of the reconciliation everywhere around us, in primary- and secondary-school curricula, in the organization of colleges and universities, and in our own mental furniture.

There are a great many ways to discuss modern modes of thought We shall pursue only one, not because it is clearly the best way, but because it is economical and it will permit us to look backward, especially to Aristotle, and forward, to new ways of construing mind and the world. What we shall do is distinguish

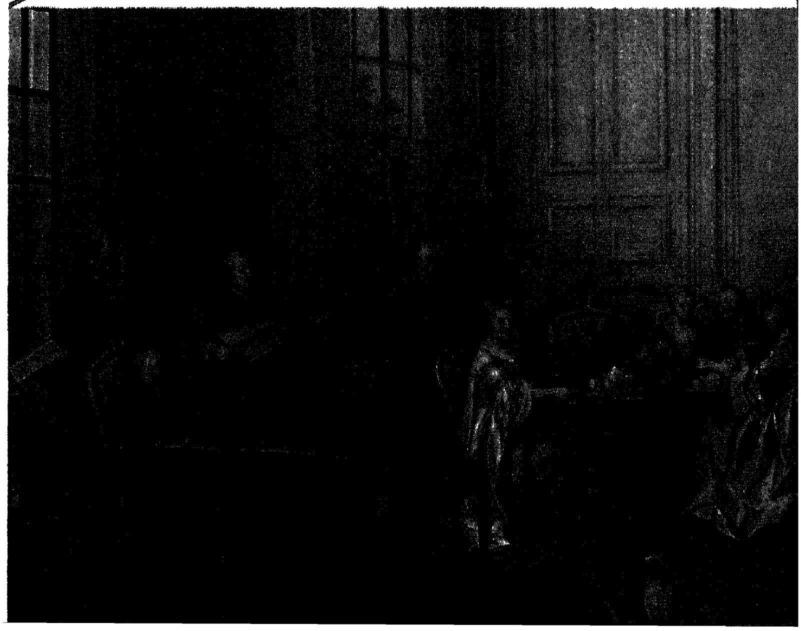
1. **sequential ways of thinking from**
2. **cross-sectional ways of thinking.**

These two modes are sometimes observed or practiced in their pure forms, but most frequently we find them mixed together. Our intention will be carefully to sort out sequential from cross-sectional modes of thought, so that we can then put them together in an unfamiliar and fruitful way

A Sequence
A is an archaic harp Its frame is upright, and its strings are plucked by hand *B* is a harpsichord A large harp-frame is laid down and its strings plucked by quills, which are activated from a keyboard. *C* is a modern piano. Now the harp-frame is quite heavy, and its strings are tightly stretched across it. These strings are not plucked but hit with hammers The hammers are also activated from a keyboard, like the quills in a harpsichord *D* is an electronic synthesizer We retain the keyboard, but the harp-frame and strings are gone, replaced by electronic tone-producers The four instruments follow one another in the history of musical-instrument invention

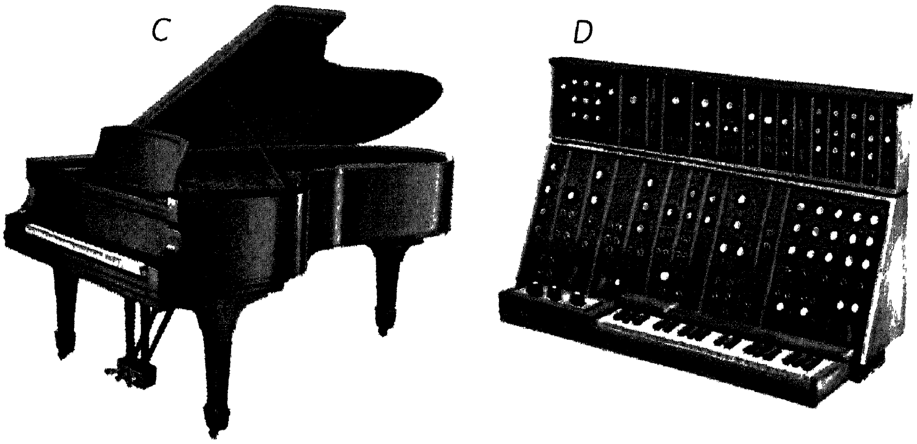


A Cross-Section
We now examine the harpsichord closely It is being played in an appropriate 18th-century setting. We could radiate outward from this scene to include more and more of 18th-century European life

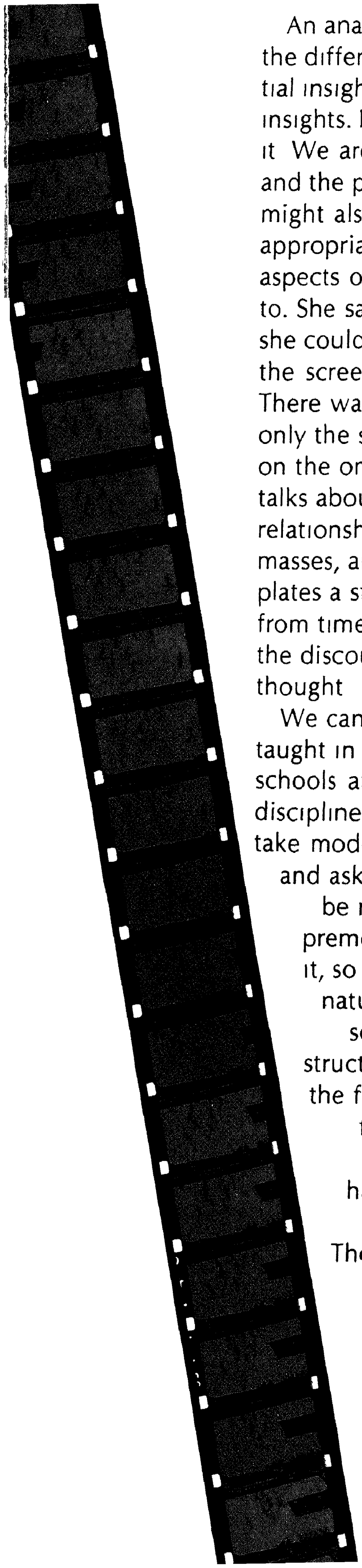


The five-year-old Wolfgang Amadeus Mozart playing the harpsichord at the salon of the Princesse de Conti Painting by Michel Barthélemy Ollivier

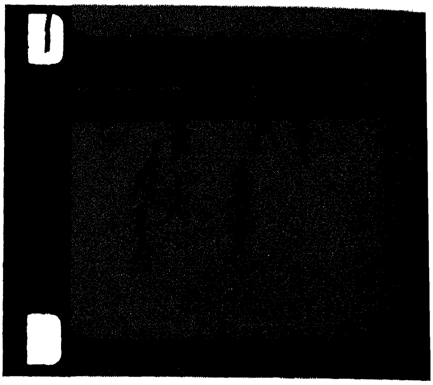
The arrow pointing to the right in the illustration represents our common-sense notion of time. Any situation **A** is earlier than **B; D** is later than **C. A, B, C,** and **D** are also different from one another To change the example, let us say that **A** stands for the condition of the American colonies before the Revolution, **B** for the years of the Revolution, **C** for the republic in the 19th century, and **D** for present-day America. They are all different in a great many ways Historians sort these ways into economic differences, political differences, literary differences, and so on. They normally speak about continuities and discontinuities as they move from **A** to **B** to **C** to **D** in a language of change and difference over time. We shall call all of this sequential thinking



Now let us extract **B** from the series and enlarge it. We shall not here be interested in how **B** emerged from **A,** or how **C** will emerge from **B.** We are absorbed by the detailed structure of **B.** We have taken **B** out of time, so we cannot use a language of change-over-time to talk about it. Since our interest is in the more and more refined details of the cross section, we will range on and about the plane cut by **B.** The example from the history of musical-instrument invention can be used to reveal important and hidden features of 18th-century Western culture. The harpsichord's physical construction suited it to sounding many melodies at once, with equal emphasis. The later piano, with its new means for changing emphases, often subordinated fewer musical materials to one melody. The harpsichord's construction consequently points to how 18th-century Europeans actually heard, and it suggests that they heard differently from us. Moving from an instrument's design to facts of human perception, all in one moment of time, is an act of cross-sectional thinking.



An analogy to one of our commonest experiences may illustrate the differences between a "language of change", carrying sequential insights, and a "language of structure", carrying cross-sectional insights. Imagine that we have gone to a film and are talking about it. We are discussing the coherence of the characters in the film and the plausibility of its plot. These are the kinds of questions we might also raise of a novel or a history book. They are questions appropriate to sequential thought. But one of us is interested in aspects of filmmaking that the others do not pay much attention to. She saw the film a second time under circumstances in which she could stop the projector when she wished. What remained on the screen when she did stop the projector was a single frame. There was no motion then, no development of character or plot, only the shapes and shadows on the one frame. She, unlike us, talks about composition, relationships among textures, masses, and lines. She contemplates a static moment, extracted from time and change. Hers is the discourse of cross-sectional thought.



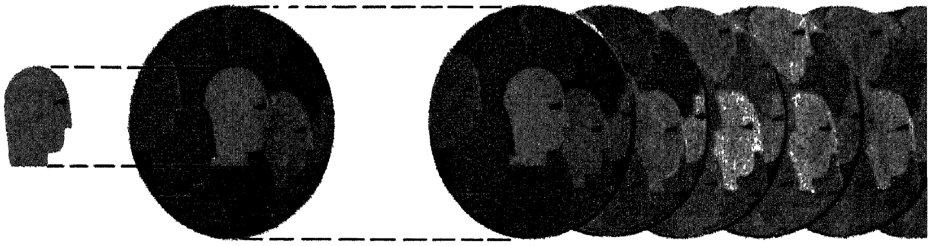
We can divide the courses taught in typical secondary schools and colleges roughly into cross-sectional and sequential disciplines. The social sciences, like sociology and anthropology, take modern or premodern societies at a single moment in time and ask structural questions about them. The questions tend to be neutral and systematic, we are not expected to admire a premodern society on reading an anthropologist's account of it, so much as to achieve an analytic understanding of it. The natural sciences, like biology and physics, show both cross-sectional and sequential aspects. One may study the fine structures of a flower on the one hand—again, not to admire the flower but to know it analytically—or one may study the flower's growth from bud to maturity. It is preeminently history, of course, that asks sequential questions. As it happens, there have been both "proper" and "improper" sequential questions in the history of thought.

The kind of sequential explanation a historian or historical biologist can offer has almost always been intensely contested. In most sequential disciplines, successive

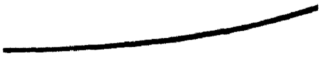
The best way to understand Greece or modern physics is to read a great deal in the Greek poets and philosophers and to read in, or do, modern physics. In school, many of us remain a remove away from the poets and physicists. We read textbooks *about* poetry, Greece, or physics. This is frequently an unfortunate remove, but it *can* be a useful one. The textbook, if it is very good, assumes a distance from its subject and transmits to us the special virtue of distance, an inclusive vision. At a second remove from the original literary and scientific texts we have encyclopedias. A good encyclopedia can give us both the distance of a textbook and the kind of brevity, uncommon in textbooks, that informs in order to whet the urge to know. In encyclopedias the whole range of sequential and cross-sectional modes of knowing, along with every scholarly bias, can be found. And although encyclopedias themselves are controlled by civilized, usually Aristotelian conceptions of the world, their *use* is not. Among our memorable experiences are the enjoyable hours we have spent meandering through a good encyclopedia. The volumes, sitting on shelves in alphabetical order, become the occasions not only for specific investigations but for reveries of the most diverse kinds. In this way those scores of essays can activate both our analytical and imaginative capacities.

states-of-affairs used to be connected in the way *means* are connected to *ends* They now tend to be connected as *causes* and *effects.* Day-to-day thinking makes continuous use of both kinds of sequencing We "plan for the future", or imagine desirable ends We then try to act in order to bring those ends about So our acts are often means to imagined ends But we use our knowledge of causes and effects to make those acts consequential in a cause-and-effect world.

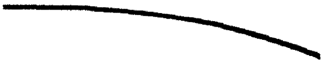
If we take the sequential and cross-sectional postures toward the multiple worlds in which we live—the interior world; the social worlds extending outward from the family; the inanimate, technical world; and the animate, natural world—if we hold these two orientations firmly in mind, then we can imagine them brought into a special relationship. To paraphrase the French philosopher Jean-Paul Sartre, we can imagine the cross-sectional disciplines being reintegrated into the sequential disciplines We can then contemplate the possibility of thinking about the stopped frame and the film at the same time, which is to say, we can move toward inserting the psychological cross section into the sociological cross section, and then fitting the sociological cross section into a generously conceived history, an act of thought that might transform our conceptions of mind and the world.



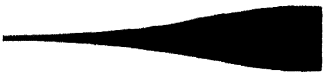
The remarkable possibility of thinking in more than one way, not in succession but at the same time, requires a shift in where to look for analogies It is difficult to imagine *seeing* both the stopped frame and the film, but we encounter an altogether different physiology when we turn to *hearing* Another French philosopher, Claude Lévi-Strauss, once remarked that music might someday offer a model for a more adequate kind of thinking Let us imagine that we are hearing one melody, which rises in pitch



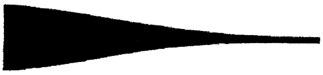
and falls,



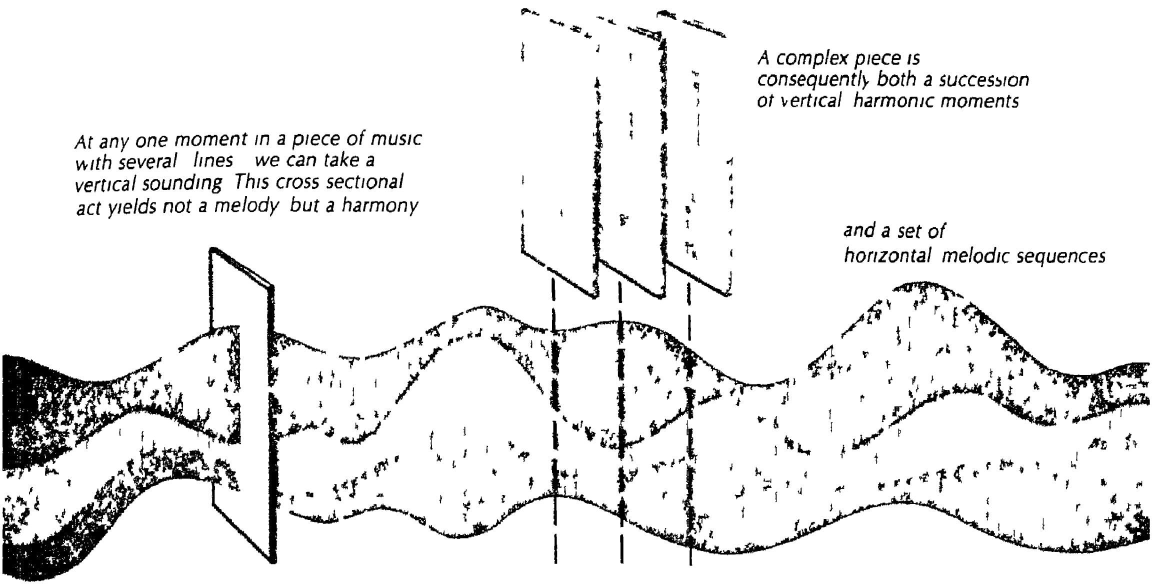
and swells in volume



and diminishes.



Most of us can only hear one melody at a time But—and this is the important point—we can be taught to hear several melodies at once



At any one moment in a piece of music with several lines we can take a vertical sounding This cross sectional act yields not a melody but a harmony

A complex piece is consequently both a succession of vertical harmonic moments

and a set of horizontal melodic sequences

This way of regarding music would merely be an interesting exercise if it were not that almost anyone can be led from hearing a single melody to truly hearing several melodies and their harmonies simultaneously Aural space is thus "filled" If we were to ask experienced listeners how they feel while listening to great music, we would find that for them, this "full hearing" is synonymous with a profound variety of happiness

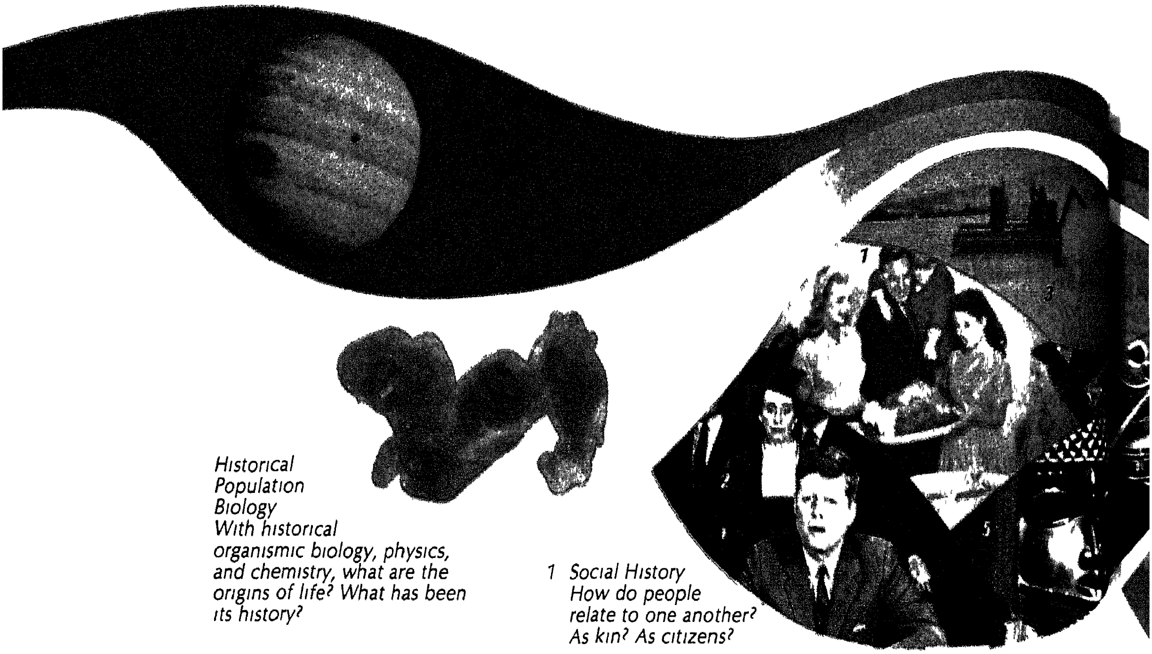
Even the distinction between cross sectional and sequential orderings of the world ultimately comes from Aristotle As well as proposing his preliminary study and three sciences, Aristotle gave a methodical definition of what it was to know something I know an object" only when I can give four accounts of it The accounts are

1 about the material of the object what it is made of,
2 about the form of the object, its shape,
3 about the activities immediately responsible for the object s having assumed its shape, and
4 about the purpose of the activities causing the object to assume its shape, and the purpose of the object

If we examine the four accounts closely, we will find that cross-sectional studies are of the first and second kinds They deal with forms, materials, and relationships considered at one moment Sequential studies are of the third and fourth kinds They either deal with causes and effects over a period of time as do Aristotle s third accounts or with means and ends over a period of time, as do his fourth accounts

A cross sectional view of a geode a stone lined with quartz crystals

Cosmogony and Cosmological Astronomy
What are the origins of the universe?
What can we say about its history?

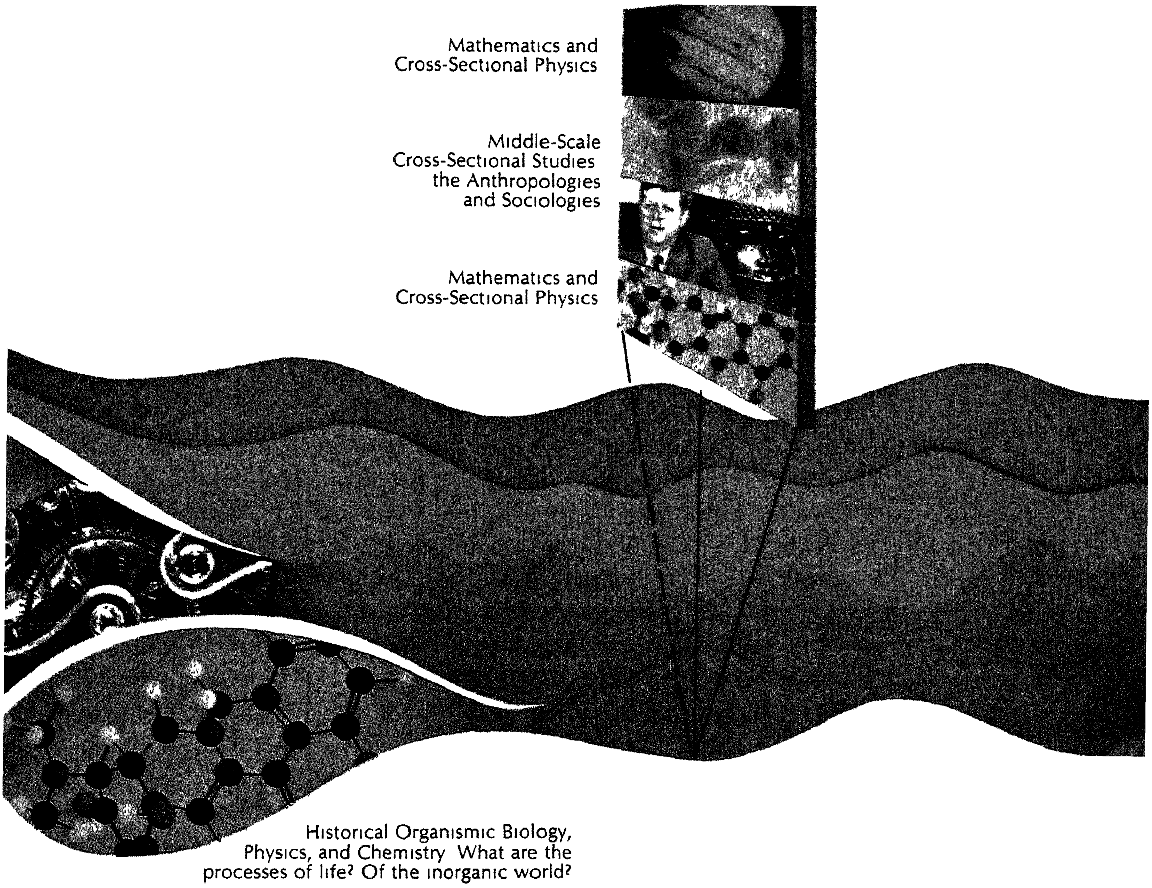


Historical Population Biology
With historical organismic biology, physics, and chemistry, what are the origins of life? What has been its history?

1 *Social History How do people relate to one another? As kin? As citizens?*
2 *Political History How do groups make decisions? What is authority?*
3 *Economic History How do people eat? How do they exchange what they have and do not need for what they do not have and need?*
4 *Technological History How do people use nature to construct other-than-natural objects and environments?*
5 *Symbolic History How do people confer meaning on the parts of the world? How do they create?*

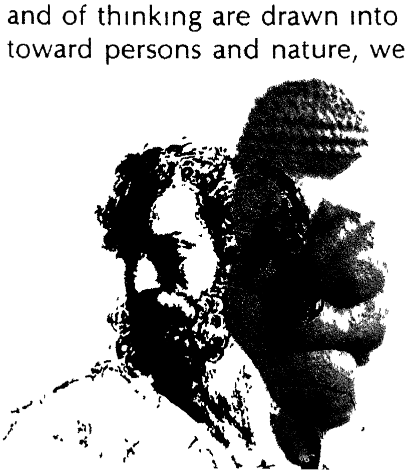
Is there a condition of profound intellectual happiness accompanying "full thinking"? If we were to represent sequential disciplines as melodies and cross-sectional disciplines as harmonies, perhaps, after a patient apprenticeship, we could begin to think the disciplines simultaneously, filling intellectual space, and feeling intellectual happiness.

If sequential and cross-sectional explanations could be brought together, let us say on the model of a fully heard piece of music, the parts of the Aristotelian conception of knowing would be made a whole In this synthesis, we of course stay in the civilized realm of precision and order, abstractions, distinctions, and subordinations. But music has pointed to a larger synthesis, and the continued study of personal and cultural precivilization will give us the remaining materials for it We can guess, at least, at the consequences for our lives of bringing the parts of civilized thinking together to form a whole, and of then bringing this whole


Mathematics and Cross-Sectional Physics
Middle-Scale Cross-Sectional Studies the Anthropologies and Sociologies
Mathematics and Cross-Sectional Physics
Historical Organismic Biology, Physics, and Chemistry What are the processes of life? Of the inorganic world?

together with precivilized modes of thought, to form the fully human whole.

We will have the breadth and continuity of human mental life back—not just 5000 or 2000 years, in the Middle East and Europe, but 40,000 years, over Eurasia, Africa, and the Americas The modern world is locked into what appears to be an overwhelming combination of troubles—epidemic loneliness and murderous contests on every scale, environmental exhaustion and overpopulation We urgently need models for repositioning ourselves toward such crises, or else we may fail our children in a tragic, even if well-meaning, way If our notions of the human condition and of thinking are drawn into civilized times and their positions toward persons and nature, we may not be able to maintain our good faith to the next generation. But all the models we will ever need are on that screen we imagined, displaying its 40,000 years of human experience. And all the illumination we will ever need can be supplied by our minds working wholly.



We must probably step quite far backward, not forward, if we are to guarantee the future of this planet. Backward in personal history, to repossess childhood reverie and imagination, bringing them forward to join the problem-solving apparatus of adulthood. And backward in cultural history to repossess precivilized kinship and its imagination, its reveries of increase. We cannot replace adult problem-solving and civilized law and science, nor do we wish to. A satisfactorily inclusive conception of mind would give us reveries *and* the Aristotelian master pattern. We want to analyze the biologist's flower, but it is also the child's flower, and we left its beauty out. We need it back, we need equally to daydream over it. We can have kinship *and* the law. The wrenching loneliness of which no one speaks can be spoken and understood, if our imaginations are released by the dynamisms of kinship, it can be overcome. The law and modern styles of governance can be reexamined in a much enlarged intellectual and historical context. When they are situated correctly, the likelihood of their being put to increasingly humane purposes will be greater. We can have increase *and* science. This juxtaposition probably appears strange, but it is exact. The words that make up a science are precise and ordered in conformation with Aristotle's two principles of correct thinking. These words cannot change, let alone increase, in meaning, they must remain attached to single meanings. It is just the special feature of the words associated with childhood reveries and precivilized myths that they do increase their meanings. The repossession of our origins, of reverie and kinship and increase, and their placement beside our present historical moment, to constitute one human condition and a genuine fullness of mind toward it—this may be the project of thinking in the 20th century.

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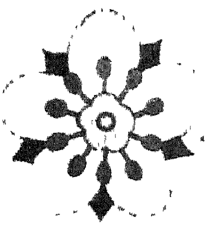
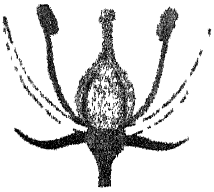
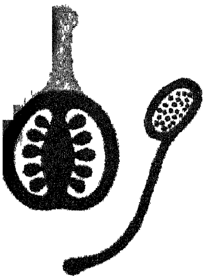
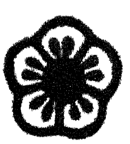
Hobart and William Smith Colleges









WORLD STATISTICS

PRINCIPAL CITIES OF THE WORLD

The cities listed here are representative of major capitals and other cities of widespread interest

* National capital
[1] Greater city
[2] Municipality

For further reading on topics related to *On the Origins and Purposes of Thinking,* see the following articles

Agriculture *History*
Anthropology
Archeology
Aristotle
Art *History*
Babylonia *Babylonian Civilization*
City
Egypt, Arab Republic of *History*
Encyclopedia
Ethics
Family
Hammurabi, Code of
History and Historiography
Hobbes, Thomas
Language
Law
Locke, John
Logic
Man
Man, Ancient
Mythology
Newton, Sir Isaac
Philosophy *Greek Philosophy*
Plato
Religion *Primitive Religions*
Sartre, Jean-Paul
Sumer

Abidjan, Ivory Coast	650,000[1]
Accra, *Ghana	564,194
Addis Ababa, Ethiopia	795,000
Adelaide, Australia	809,466[1]
Agra, India	594,858
Ahmadabad, India	1,588,378
Aleppo, Syria	639,361
Alexandria, Egypt	2,032,000
Algiers, Algeria	1,839,000
Amman, *Jordan	560,000
Amsterdam, Netherlands	807,742
Ankara, Turkey	1,208,791[1]
Anshan, China	1,500,000[2]
Antwerp, Belgium	919,814
Athens, Greece	867,023
Baghdad, *Iraq	1,028,083
Baku, U S S R	1,314,000[1]
Baltimore, Md	905,759
Bandung, Indonesia	1,201,730
Bangalore, India	1,648,232[1]
Bangkok, *Thailand	2,132,000[1]
Barcelona, Spain	1,742 000
Barranquilla, Colombia	840,000[1]
Beirut, *Lebanon	800,000[1]
Belgrade, *Yugoslavia	741,618
Belo Horizonte, Brazil	1,106,722
Berlin, Germany	3,170,372
East Berlin	1,086,374
West Berlin	2,083,998
Birmingham, England	1,013,366
Bogotá, *Colombia	2,800,000[1]
Bombay, India	5,968,546
Boston, Mass	641,071
Bremen, West Germany	594,591
Brisbane, Australia	699,371
Brussels, *Belgium	1,071,194[1]
Bucharest, *Rumania	1,600,000
Budapest, *Hungary	2,040,000
Buenos Aires, *Argentina	2,972,453
Cairo, *Egypt	5,126,000
Calcutta, India	3,141,180
Cali, Colombia	1,100,000[1]
Canton, China	2,300,000[2]
Cape Town, *South Africa	825,752[1]
Caracas, *Venezuela	1,035,499
Casablanca, Morocco	1,506,373
Changchun, China	1,500,000[2]
Chelyabinsk, U S S R	910,000
Chengchow, China	1,500,000[2]
Chengtu, China	2,000,000[2]
Chicago, Ill	3,366,957
Chungking, China	3,500,000[2]
Cleveland, Ohio	750,903
Cologne, West Germany	846,479
Colombo, *Sri Lanka	563,705
Columbus, Ohio	539,677
Copenhagen, *Denmark	625,678
Córdoba, Argentina	798,663
Dacca, *Bangladesh	1,500,000[1]
Dakar, *Senegal	550,000
Dallas, Texas	844,401
Damascus, *Syria	836,179
Delhi, India	3,279,955
Denver, Colo	514,678
Detroit, Mich	1,511,482
Djakarta, Indonesia	4,576,009
Dnepropetrovsk, U S S R	903,000
Donetsk, U S S R	905,000
Dortmund, West Germany	642,396
Dresden, East Germany	500,051
Dublin, Ireland	567,866
Durban, South Africa	663,000[1]
Dusseldorf, West Germany	650,377
Erivan, U S S R	791,000
Essen, West Germany	691,830
Frankfurt-am-Main, West Germany	657,776
Fukuoka, Japan	853,270
Fushun, China	1,700,000[2]
Genoa, Italy	841,978[1]
Glasgow, Scotland	897,848
Gor kiy, U S S R	1,213,000
Guadalajara, Mexico	1,194,600
Guatemala, *Guatemala	790,311
Guayaquil, Ecuador	701,227
Hague, The, Netherlands	525,368
Hamburg, West Germany	1,781,621
Hannover, West Germany	516,744
Hanoi, *Vietnam	1,378,335
Harbin, China	2,750,000[2]
Havana, *Cuba	1,130,634
Helsinki, Finland	514,652
Houston, Texas	1,232,802
Hyderabad, India	1,612,276
Ibadan, Nigeria	758,332
Inch'on, South Korea	646,013
Indianapolis, Ind	744,624
İstanbul, Turkey	2,247,630[1]
Jacksonville, Fla	528,865
Johannesburg, S Africa	1,407,963[1]
Kanpur, India	1,151,975
Kansas City, Mo	507,087
Karachi, Pakistan	3,469,000[1]
Kawasaki, Japan	973,486
Kazan', U S S R	904,000
Khar'kov, U S S R	1,280,000
Kiev, U S S R	1,764,000
Kinshasa, Zaire	1,323,039
Kitakyushu, Japan	1,042,321
Kobe, Japan	1,288,937
Kunming, China	1,700,000[2]
Kuybyshev, U S S R	1,094,000
Kweiyang, China	1,500,000[2]
Kyoto, Japan	1,419,165
Lagos, *Nigeria	900,969
Lahore, Pakistan	2,148,000[1]
Lanchow, China	1,500,000[2]
La Paz, *Bolivia	605,200
Leeds, England	494,971
Leipzig, East Germany	583,311
Leningrad, U S S R	4,066,000[1]
Liège, Belgium	621,935
Lima, *Peru	3,800,000[1]
Lisbon, *Portugal	782,266
Liverpool, England	606,834
London, *England	7,452,346
(metropolitan area)	12,761,700

Principal Cities (continued)

Los Angeles, Calif	2,816,061
Lucknow, India	750,512
Luta, China	4,000,000[2]
Lyon, France	527,800
Madras, India	2,470,288
Madrid, *Spain	3,120,900
Manchester, England	541,468
Manila, *Philippines	1,377,000
Maracaibo, Venezuela	650,002
Marseille, France	813,000
Medan, Indonesia	635,562
Medellín, Colombia	1,600,000[1]
Melbourne, Australia	2,388,941[1]
Memphis, Tenn	623,530
Mexico City, *Mexico	3,025,600
Milan, Italy	1,707,576[1]
Milwaukee, Wis	717,099
Minsk, U S S R	996,000[1]
Monterrey, Mexico	858,100
Montevideo, *Uruguay	1,500,000[1]
Montréal, Canada	1,080,546
Moscow, *U S S R	7,300,000[1]
Mukden, China	3,750,000[2]
Munich, West Germany	1,338,432
Nagoya, Japan	2,036,053
Nagpur, India	866,144
Nairobi, *Kenya	535,200[1]
Nanking, China	2,000,000[2]
Naples, Italy	1,277,438[1]
New Orleans, La	593,471
New York, N Y	7,867,760
(metropolitan area)	11,528,649
Novosibirsk, U S S R	1,199,000
Odessa, U S S R	941,000
Omsk, U S S R	876,000
Osaka, Japan	2,980,487
Ottawa, *Canada	304,462
Palembang, Indonesia	582,961
Palermo, Italy	661,477[1]
Paris, *France	2,580,010
(metropolitan area)	9,283,000
Peking, *China	7,570,000[2]
Perm', U S S R	881,000
Perth, Australia	639,622[1]
Philadelphia, Pa	1,948,609
Phnom Penh, *Cambodia	600,000
Phoenix, Ariz	581,562
Pittsburgh, Pa	520,117
Poona, India	853,226
Porto Alegre, Brazil	869,795
Prague, *Czechoslovakia	1,078,096
Pusan, South Korea	1,880,710
P'yŏngyang, *North Korea	1,500,000[1]
Quezon City, Philippines	780,700
Rangoon, *Burma	1,821,752
Recife, Brazil	1,046,454
Rio de Janeiro, Brazil	4,252,009
Rome, *Italy	2,799,836[1]
Rosario, Argentina	798,292
Rostov, U S S R	789,000
Rotterdam, Netherlands	670,060
Saigon, Vietnam	2,200,000
Saint Louis, Mo	622,236
Salvador, Brazil	998,258
San Antonio, Texas	654,153
San Diego, Calif	696,769
San Francisco, Calif	715,674
Santiago, *Chile	2,661,920[1]
Santo Domingo, *Dom Rep	671,402
São Paulo, Brazil	5,186,752
Sapporo, Japan	1,010,123
Saratov, U S S R	773,000
Seattle, Wash	530,831
Semarang, Indonesia	646,590
Seoul, *South Korea	5,536,377
Seville, Spain	545,700
Shanghai, China	10,820,000[2]
Sheffield, England	519,703
Shihkiachwang, China	1,500,000[2]
Sian, China	1,900,000[2]
Singapore, *Singapore	2,016,800[1]
Sofia, *Bulgaria	876,943
Stockholm, *Sweden	746,560
Stuttgart, West Germany	632,947
Suchow, China	1,500,000[2]
Surabaja, Indonesia	1,556,255
Sverdlovsk, U S S R	1,073,000
Sydney, Australia	2,717,069[1]
Taegu, South Korea	1,082,750
Taipei, *Taiwan (China)	1,700,000
Taiyuan, China	2,725,000[2]
Tashkent, U S S R	1,461,000
Tbilisi, U S S R	927,000
Tehran, *Iran	3,400,000[1]
Tientsin, China	4,280,000[2]
Tokyo, *Japan	8,840,902
(metropolitan area)	11,408,071
Toronto, Canada	633,318
Tsinan, China	1,500,000[2]
Tsingtao, China	1,900,000[2]
Tsitsihar, China	1,500,000[2]
Tunis, *Tunisia	642,000
Turin, Italy	1,183,864[1]
Tzepo, China	1,750,000[2]
Ufa, U S S R	796,000
Valencia, Spain	648,000
Varanasi, India	560,296
Victoria, *Hong Kong	996,183[1]
Vienna, *Austria	1,614,841
Volgograd, U S S R	852,000
Warsaw, *Poland	1,308,900
Washington, D C *U S A	756,510
Wuhan, China	4,250,000[2]
Yokohama, Japan	2,238,264
Zagreb, Yugoslavia	566,084

PRINCIPAL LAKES AND INLAND SEAS OF THE WORLD

The area given is in square miles

Caspian Sea	143,243
Lake Superior	31,830
Lake Victoria	26,828
Aral Sea	26,630
Lake Huron	23,010
Lake Michigan	22,178
Lake Tanganyika	12,700
Lake Baykal	12,162
Great Bear Lake	12,096
Lake Malawi (Nyasa)	11,500
Great Slave Lake	11,031
Lake Erie	9,940
Lake Winnipeg	9,417
Lake Ontario	7,540
Lake Ladoga	7,100
Lake Balkhash	6,700
Lake Chad	6,500
Lake Onega	3,765
Lake Titicaca	3,200
Lake Nicaragua	3,100
Lake Athabasca	3,064
Reindeer Lake	2,568
Issyk-kul	2,276
Vänern	2,149
Lake Urmia	1,795
Great Salt Lake	1,700
Lake Albert	1,640
Lake Van	1,453
Lake Peipus	1,400
Lake Tana	1,219
Lake Bangweulu	approx 1,000
Vättern	733
Dead Sea	405
Lake Balaton	400
Lake Geneva	225
Lake Constance	208
Lake Tahoe	193
Lough Neagh	153
Lake Garda	143
Lake Neuchâtel	83
Lake Maggiore	82
Lough Corrib	71
Lake Como	56
Lake Lucerne	44
Lake Zurich	34

PRINCIPAL ISLANDS OF THE WORLD

The area is given in square miles

Greenland	840,000
New Guinea	320,000
Borneo	287,000
Madagascar	226,657
Baffin	195,928
Sumatra	164,000
Philippines	115,707
New Zealand, North and South Islands	103,736
Honshu	88,919
Great Britain	88,755
Victoria	83,896
Ellesmere	75,767
Celebes	73,000
Java	48,842
Newfoundland	42,734
Cuba	41,634
Luzon	40,814
Iceland	39,709
Mindanao	36,537
Novaya Zemlya	35,000
Moluccas	33,315
Ireland	31,838
Hokkaido	30,307
Hispaniola	29,530
Banks	27,038
Tasmania	26,304
Ceylon (Sri Lanka)	25,332
Svalbard	25,000
Sakhalin	24,560
Timor Archipelago	24,450
Devon	21,331
Bismarck Archipelago	20,000
Tierra del Fuego	18,500
Solomon Islands	16,880
Melville	16,274
Southampton	15,913
Kyushu	14,990
New Britain	14,600
Taiwan (Formosa)	13,906
Hainan	13,000
Prince of Wales	12,872
Vancouver	12,079
Sicily	9,925
Somerset	9,570
Sardinia	9,302
Fiji Islands	7,083
New Caledonia	6,531
New Hebrides	5,700
Kuril Islands	5,700
Falkland Islands	4,618
Jamaica	4,411
Bahamas	4,404
Hawaii	4,021
Cape Breton	3,981
New Ireland	3,800
Cyprus	3,572
Puerto Rico	3,423
Corsica	3,367
Crete	3,235
Hebrides	2,900
Galápagos Islands	2,868
Canary Islands	2,807
Prince Edward	2,184
Balearic Islands	1,936
Trinidad	1,864
Wrangel	1,800
Madura	1,760
Long Island, N Y	1,628
Cape Verde Islands	1,557
South Georgia	1,450
Socotra	1,382
Kerguelen	1,318
Samoa	1,229
Gotland	1,225
Isle of Pines	1,180
Réunion	970
Azores	888
Macías Nguema Biyogo (Fernando Po)	810
Tenerife	795
Maui	728
Mauritius	720
Zanzibar	640
Guadeloupe	619
Oahu	589
Ahvenanmaa	572
Kauai	551
Shetland Islands	550
Caroline Islands	550
Rhodes	542
Faerøe Islands	540
Marquesas Islands	480
Tahiti	402
Martinique	385
Pemba	380
Orkney Islands	376
Dominica	305
Madeira Islands	286
Molokai	260
Tonga, or Friendly, Islands	250
Saint Lucia	233
Kérkira (Corfu)	229
Isle of Man	227
Singapore	220
Bornholm	215
Isle Royale	209
Guam	203
Virgin Islands	200
Curaçao	173
Barbados	166
Seychelles	156
Saint Vincent	150
Isle of Wight	147
Lanai	141
Grenada	120
Martha's Vineyard	120
Tobago	116
Malta	95
Channel Islands	75
Nantucket	51
Saint Helena	47
Ascension	34
Hong Kong	32
Manhattan, N Y	31
Bermuda Islands	22

LONGEST RIVERS OF THE WORLD

The length is given in miles

Nile, Africa	4,145
Amazon, S A	3,900
Mississippi-Missouri, U S A	3,741
Ob'-Irtish, U S S R	3,460
Yangtze, China	3,400
Hwang (Yellow), China	2,900
Congo, Africa	2,718
Amur, Asia	2,700
Lena, U S S R	2,680
Mekong, Asia	2,600
Niger, Africa	2,600
Yenisey, U.S S R	2,543
Paraná, S A	2,450
Murray, Australia	2,310
Volga, U S S R	2,194
Madeira, S A	2,000
Saint Lawrence, Canada—U S A	1,900
Rio Grande, U S A — Mexico	1,885

Longest Rivers (continued)

Yukon, Alaska	1,875
Purus, S A	1,850
São Francisco, S A	1,800
Salween, Burma	1,750
Danube, Europe	1,725
Euphrates, Iraq	1,700
Indus, Pakistan	1,700
Orinoco, S A	1,700
Tocantins, S A	1,700
Brahmaputra, India	1,680
Syr-Dar'ya, U S S R	1,680
Si, China	1,650
Zambezi, Africa	1,600
Ural, U S S R	1,575
Amu-Dar'ya, U S S R	1,550
Ganges, India	1,540
Olenek, U S S R	1,500
Paraguay, S A	1,500
Japurá, S A	1,500
Arkansas, U S A	1,450
Colorado, U S A — Mexico	1,450
Dnieper, U S S R	1,420
Rio Negro, S A	1,400
Kolyma, U S S R	1,335
Ohio-Allegheny, U S A	1,306
Orange, Africa	1,300
Kama, U S S R	1,260
Irrawaddy, Burma	1,250
Columbia, U S A —Canada	1,243

Red, U S A	1,222
Don, U S S R	1,220
Brazos, U S A	1,210
Saskatchewan, Canada	1,205
Peace, Canada	1,195
Darling, Australia	1,160
Angara, U S S R	1,150
Tigris, Iraq	1,150
Sungari, Asia	1,130
Pechora, U S S R	1,110
Mackenzie, Canada	1,060
Churchill, Canada	1,000
Pilcomayo, S A	1,000
Snake, U S A	1,000
Uruguay, S A	1,000
Magdalena, S A	950
Platte, U S A	930
Oka, U S S R	920
Canadian, U S A	906
Colorado (Texas), U S A	894
Tennessee-French Broad, U S A	869
Dniester, U S S R	850
Fraser, Canada	850
Rhine, Europe	820
Northern Dvina, U S S R	805
North Saskatchewan, Canada	800
Tisza, Europe	800
Athabasca, Canada	765

PRINCIPAL MOUNTAINS OF THE WORLD

The peaks listed here are a representative selection, chosen for their diversified location and general interest The elevation is given in feet

Everest, China—Nepal	29,028
Godwin Austen (K2), Kashmir	28,250
Kanchenjunga, Nepal—India	28,208
Makalu, China—Nepal	27,790
Dhaulagiri, Nepal	26,810
Nanga Parbat, Kashmir	26,660
Annapurna, Nepal	26,504
Nanda Devi, India	25,645
Kamet, India	25,447
Gurla Mandhata, China	25,355
Tirich Mir, Pakistan	25,230
Minya Konka, China	24,902
Muztagh Ata, China	24,757
Communism Peak, U S S R	24,590
Pobeda Peak, U S S R	24,406
Chomo Lhari, China—Bhutan	23,997
Aconcagua, Argentina	22,831
Ojos del Salado, Argentina—Chile	22,572
Tupungato, Argentina—Chile	22,310
Mercedario, Argentina	22,211
Huascarán, Peru	22,205
Llullaillaco Volcano, Chile	22,057
Ancohuma, Bolivia	21,489
Illampu, Bolivia	21,276
Chimborazo, Ecuador	20,561
McKinley, Alaska	20,320
Logan, Yukon	19,524
Cotopaxi, Ecuador	19,347
Kilimanjaro, Tanzania	19,340
El Misti, Peru	19,199
Citlaltépetl, Mexico	18,855
El'brus, U S S R	18,481
Demavend, Iran	18,376
St Elias, Alaska—Yukon	18,008
Vilcanota, Peru	17,999
Popocatépetl, Mexico	17,887
Kenya, Kenya	17,058
Ararat, Turkey	16,946
Vinson Massif, Antarctica	16,864
Margherita (Ruwenzori), Uganda—Zaire	16,795

Kazbek, U S S R	16,558
Djaja, Indonesia	16,503
Blanc, France	15,771
Klyuchevskaya Sopka, U S S R	15,584
Rosa (Dufourspitze), Italy—Switzerland	15,203
Ras Dashan, Ethiopia	15,157
Matterhorn, Switzerland	14,688
Whitney, Calif	14,494
Elbert, Colo	14,433
Rainier, Wash	14,410
Markham, Antarctica	14,272
Shasta, Calif	14,162
Pikes Peak, Colo	14,110
Finsteraarhorn, Switzerland	14,022
Vol Tacaná, Guatemala—Mexico	13,900
Vol Tajumulco, Guatemala	13,845
Mauna Kea, Hawaii	13,796
Grand Teton Peak, Wyo	13,770
Mauna Loa, Hawaii	13,680
Toubkal, Morocco	13,665
Jungfrau, Switzerland	13,642
Kinabalu, Malaysia	13,455
Cameroon, Cameroon	13,350
Gran Paradiso, Italy	13,323
Robson, British Columbia	12,972
Grossglockner, Austria	12,457
Fuji, Japan	12,389
Cook, New Zealand	12,349
Pico de Teide, Canary Is	12,172
Semeru, Java, Indonesia	12,060
Mulhacén, Spain	11,411
Leuser, Sumatra, Indonesia	11,093
Etna, Sicily, Italy	11,053
Vol Irazu, Costa Rica	10,525
Lassen Peak, Calif	10,457
Pico Duarte, Dominican Republic	10,417
Tina, Dominican Republic	9,239
Kosciusko, Australia	7,316
Mitchell, N C	6,684

HIGHEST AND LOWEST ALTITUDES

Continent	Approx Mean Elevation in Feet	Peak, or Location	Highest Point in Feet	Location	Lowest Point Below Sea Level, in Feet
Africa	1,900	Kilimanjaro, Tanzania	19,340	Qattara Depression, U A R	436
Antarctica	6,000	Vinson Massif	16,864	Sea Level	
Asia	3,000	Mt Everest, China—Nepal	29,028	Dead Sea, Israel	1,292
Australia	1,000	Mt Kosciusko, N S W	7,316	Lake Eyre, S Australia	39
Europe	980	Mt El'brus, U S S R	18,481	Caspian Sea, U S S R —Iran	92
North America	2,000	Mt McKinley, Alaska	20,320	Death Valley, Calif	282
South America	1,800	Mt Aconcagua, Argentina	22,831	Rio Negro, Argentina	98

United States and Possessions	in Feet	Peak, or Location	in Feet	Location	Height in Feet
Alabama	500	Cheaha Mt	2,407	Gulf of Mexico	sea level
Alaska	1,900	Mt McKinley	20,320	Pacific Ocean	sea level
Arizona	4,100	Humphreys Peak	12,633	Colorado River	100
Arkansas	650	Magazine Mt , Blue Mt	2,753	Ouachita River	55
California	2,900	Mt Whitney	14,494	Death Valley	—282
Canal Zone	100	Cerro Galera	1,205	Caribbean Sea	sea level
Colorado	6,800	Mt Elbert	14,433	Arkansas River	3,350
Connecticut	500	Mt Frissell	2,380	Long Island Sound	sea level
Delaware	60	New Castle Co	442	Atlantic Ocean	sea level
District of Columbia	150	Tenleytown	410	Potomac River	1
Florida	100	On w boundary	345	Atlantic Ocean	sea level
Georgia	600	Brasstown Bald	4,784	Atlantic Ocean	sea level
Guam	650	Mt Lamlam	1,329	Pacific Ocean	sea level
Hawaii	1,990	Mauna Kea	13,796	Pacific Ocean	sea level
Idaho	5,000	Borah Peak	12,662	Snake River	710
Illinois	600	Charles Mound	1,235	Mississippi River	279
Indiana	700	Franklin Township	1,257	Ohio River	320
Iowa	1,100	Ocheyedan Mound	1,675	Mississippi River	480
Kansas	2,000	Mt Sunflower	4,039	Verdigris River	680
Kentucky	750	Black Mt	4,145	Mississippi River	257
Louisiana	100	Driskill Mt	535	New Orleans	—5
Maine	600	Mt Katahdin	5,268	Atlantic Ocean	sea level
Maryland	350	Backbone Mt	3,360	Atlantic Ocean	sea level
Massachusetts	500	Mt Greylock	3,491	Atlantic Ocean	sea level
Michigan	900	Mt Curwood	1,980	Lake Erie	572
Minnesota	1,200	Eagle Mt	2,301	Lake Superior	602
Mississippi	300	Woodall Mt	806	Gulf of Mexico	sea level
Missouri	800	Taum Sauk Mt	1,772	Saint Francis River	230
Montana	3,400	Granite Peak	12,799	Kootenai River	1,800
Nebraska	2,600	Johnson Township	5,426	S E corner of State	840
Nevada	5,500	Boundary Peak	13,140	Colorado River	470
New Hampshire	1,000	Mt Washington	6,288	Atlantic Ocean	sea level
New Jersey	250	High Point	1,803	Atlantic Ocean	sea level
New Mexico	5,700	Wheeler Peak	13,161	Red Bluff Reservoir	2,817
New York	1,000	Mt Marcy	5,344	Atlantic Ocean	sea level
North Carolina	700	Mt Mitchell	6,684	Atlantic Ocean	sea level
North Dakota	1,900	White Butte	3,506	Red River	750
Ohio	850	Campbell Hill	1,550	Ohio River	433
Oklahoma	1,300	Black Mesa	4,973	Little River	287
Oregon	3,300	Mt Hood	11,235	Pacific Ocean	sea level
Pennsylvania	1,100	Mt Davis	3,213	Delaware River	sea level
Puerto Rico	2,200	Cerro de Punta	4,389	Atlantic Ocean	sea level
Rhode Island	200	Jerimoth Hill	812	Atlantic Ocean	sea level
Samoa	1,500	Lata Peak	3,056	Pacific Ocean	sea level
South Carolina	350	Sassafras Mt	3,560	Atlantic Ocean	sea level
South Dakota	2,200	Harney Peak	7,242	Big Stone Lake	962
Tennessee	900	Clingmans Dome	6,643	Mississippi River	182
Texas	1,700	Guadalupe Peak	8,751	Gulf of Mexico	sea level
Utah	6,100	Kings Peak	13,528	Beaverdam Creek	2,000
Vermont	1,000	Mt Mansfield	4,393	Lake Champlain	95
Virginia	950	Mt Rogers	5,729	Atlantic Ocean	sea level
Virgin Islands	750	Crown Mt	1,556	Atlantic Ocean	sea level
Washington	1,700	Mt Rainier	14,410	Pacific Ocean	sea level
West Virginia	1,500	Spruce Knob	4,862	Potomac River	240
Wisconsin	1,050	Timms Hill	1,952	Lake Michigan	581
Wyoming	6,700	Gannett Peak	13,804	Belle Fourche River	3,100

OCEANS AND SEAS OF THE WORLD

	Area in Sq Miles	Greatest Depth in Feet	Volume in Cubic Miles
Pacific Ocean	64,186,300	36,198	162,870,600
Atlantic Ocean	31,600,000	27,498	75,533,900
Indian Ocean	28,350,500	25,344	69,225,200
Arctic Ocean	5,541,000	17,880	4,029,400
South China Sea	1,148,500	18,090	
Caribbean Sea	971,400	24,720	2,298,400
Mediterranean Sea	969,100	15,900	1,019,400
Bering Sea	873,000	16,800	788,500
Gulf of Mexico	582,100		
Sea of Okhotsk	537,500	11,400	454,700
Sea of Japan	391,100	12,280	383,200
Hudson Bay	281,900	1,500	37,590

SOLAR SYSTEM

	Distance from Sun in Miles				
Planets	**Maximum**	**Minimum**	**Period of Revolution Around Sun in Days**	**Diameter in Miles**	**Density (Earth = 1)**
Mercury	43,404,000	28,599,000	87 87	3,012	0 68
Venus	67,730,000	66,814,000	224 70	7,700	0 94
Earth	94,560,000	91,446,000	365 26	7,926	1 00
Mars	154,936,000	128,476,000	686 98	4,215	0 71
Jupiter	507,289,000	460,465,000	4,332 59	88,800	0 24
Saturn	936,637,000	837,655,000	10,759 20	75,100	0 12
Uranus	1,868,930,000	1,700,745,000	30,685 93	29,500	0 25
Neptune	2,820,610,000	2,773,510,000	60,187 64	27,700	0 41
Pluto*	4,585,000,000	2,753,000,000	90,470 23	1,865–2,175	0 20

* Now considered an escaped satellite of Neptune

DIMENSIONS OF THE EARTH

Superficial area	196,950,000 sq miles
Land surface	57,510,000 sq miles
North America	8,998,000 sq miles
South America	7,035,300 sq miles
Europe	3,842,000 sq miles
Asia	17,350,000 sq miles
Africa	11,710,424 sq miles
Antarctica	5,100,000 sq miles
Australia	2,948,366 sq miles
Water surface	139,440,000 sq miles
Atlantic Ocean	31,600,000 sq miles
Pacific Ocean	64,186,300 sq miles
Indian Ocean	28,350,500 sq miles
Arctic Ocean	5,541,000 sq miles
Equatorial circumference	24,902 4 miles
Meridional circumference	24,860 miles
Equatorial diameter	7,926 68 miles
Polar diameter	7,899 98 miles
Equatorial radius	3,963 34 miles
Polar radius	3,949 99 miles
Volume of the Earth	259,880,000,000 cubic miles
Mass, or weight	6,592,000,000,000,000,000,000 tons
Mean distance from the Sun	92,897,416 miles

The Moon, the only satellite of the Earth, from which its mean distance is 238,857 miles, occupies an average period, in its revolution round the earth, of 29 days, 12 hours, 44 minutes, 3 seconds, its diameter is 2,160 miles, and its mean density 0 60

POLITICAL AND SOCIAL DATA OF THE WORLD

Information on various political units, peoples, and government is presented in tabular form below and on the following pages The data are arranged alphabetically by political unit

Political Division and Capital City	Political Status	Monetary Unit	Language	Religion
Afars and the Issas, Territory of the	See *Djibouti*, below			
Afghanistan Kabul	Republic	afghani	Pashto, Persian	Muslim
Albania Tiranè	Republic	lek	Albanian	Muslim Eastern Orthodox Roman Catholic
Algeria Algiers	Republic	dinar	French, Arabic, Berber	Muslim Roman Catholic Jewish
Andorra Andorra-la-Vella	Semiautonomous principality under joint suzerainty of France and bishop of Urgel, Spain	franc, peseta	Catalan	Roman Catholic
Angola Luanda	Republic	kwanza	Bantu, Portuguese	Tribal religions
Antigua Saint Johns	Internally self-governing British associated state	East Caribbean dollar	English	Christian
Argentina Buenos Aires	Republic	peso	Spanish	Roman Catholic
Ascension Island.	See *Saint Helena*, below			
Australia Canberra	Independent self-governing member of the Commonwealth of Nations	Australian dollar	English	Protestant Roman Catholic
Austral Islands	See *Polynesia, French*, below			
Austria Vienna	Republic	schilling	German	Roman Catholic
Bahamas Nassau	Independent self-governing member of the Commonwealth of Nations	Bahamian dollar	English	Roman Catholic Protestant
Bahrain Manama	Sheikhdom	dinar	Arabic	Muslim
Bangladesh Dacca	Republic, member of the Commonwealth of Nations	taka	English, Bengali	Muslim Hindu
Barbados Bridgetown	Independent self-governing member of the Commonwealth of Nations	Barbados dollar	English	Protestant
Belgium Brussels	Constitutional monarchy	franc	French, Flemish	Roman Catholic
Benin	See *Dahomey (Benin)*, below			
Bermuda Hamilton	Internally self-governing British dependency	Bermuda dollar	English	Protestant
Bhutan Thimphu	Monarchy	ngultrum	Bhutanese (Tibetan dialect)	Buddhist
Bolivia La Paz, Sucre	Republic	peso Boliviano	Spanish, Quechua, Guaraní, Aymará	Roman Catholic

Political Division and Capital City	Political Status	Monetary Unit	Language	Religion
Botswana Gaborone	Republic, member of the Commonwealth of Nations (formerly the British protectorate of Bechuanaland)	pula	Bantu, Khoisan, English	Tribal religions Protestant
Brazil Brasília	Republic	cruzeiro	Portuguese	Roman Catholic
British Honduras (Belize) Belmopan	Internally self-governing British dependency	Br Honduras dollar	English, Spanish	Protestant Roman Catholic
Brunei Bandar Seri Begawan	British-protected sultanate	Brunei dollar	Malay, English	Muslim
Bulgaria Sofia	Republic	lev	Bulgarian	Eastern Orthodox
Burma Rangoon	Republic	kyat	Burmese, Karen, Shan, Kachin	Buddhist Tribal religions
Burundi Bujumbura	Republic	Burundi franc	Rundi, French, Swahili	Tribal religions Roman Catholic
Cambodia (Kampuchea) Phnom Penh	Republic	riel	Khmer, Thai	Buddhist
Cameroon Yaoundé	Republic	C F A franc	Sudanic, Bantu, Arabic, French	Tribal religions Muslim Christian
Canada Ottawa	Independent self-governing member of the Commonwealth of Nations	Canadian dollar	English, French	Protestant Roman Catholic
Canary Islands Las Palmas de Gran Canaria, Santa Cruz de Tenerife	Islands forming two provinces of Spain	peseta	Spanish	Roman Catholic
Cape Verde Praia	Republic	escudo	Portuguese	Roman Catholic
Caroline Islands	See *Pacific Islands, Trust Territory of the,* below			
Central African Empire Bangui	Constitutional monarchy	C F A franc	Sudanic, French	Tribal religions Christian
Ceylon (Sri Lanka) Colombo	Republic, member of the Commonwealth of Nations	Ceylon rupee	Sinhalese, Tamil	Buddhist Hindu
Chad N'Djamena (Fort-Lamy)	Republic	C F A franc	Sudanic, French	Tribal religions Muslim
Chile Santiago	Republic	peso	Spanish	Roman Catholic
China: Mainland Peking	Republic	yuan	Chinese, Mongol, Turki	Confucianist Buddhist Taoist Muslim
China: Nationalist	See *Taiwan (Formosa),* below			
Christmas Island The Settlement	Territory of Australia	Australian dollar	Chinese, Malay, English	Confucianist Muslim
Colombia Bogotá	Republic	peso	Spanish	Roman Catholic
Commonwealth of Nations	Association of sovereign nations and dependencies owing symbolic or actual allegiance to the British crown Sovereign members are I United Kingdom of Great Britain and Northern Ireland II Australia Bahamas Bangladesh Barbados Botswana Canada Ceylon (Sri Lanka) Cyprus Dominica Fiji Gambia Ghana Grenada Guyana India Jamaica Kenya Kiribati Lesotho Malawi Malaysia Malta Mauritius Nauru New Zealand Nigeria Papua New Guinea Saint Lucia Seychelles Sierra Leone Singapore Solomon Islands Swaziland Tanzania Tonga Trinidad and Tobago Tuvalu Uganda Western Samoa Zambia	See entries for separate components		

Political Division and Capital City	Political Status	Monetary Unit	Language	Religion
Comoro Islands Moroni	Republic	C F A franc	Arabic, French	Muslim
Congo, Republic of Brazzaville	Republic	C F A franc	Bantu, French	Tribal religions Christian
Cook Islands Avarua	Internally self-governing part of New Zealand	New Zealand dollar	Polynesian dialects, English	Protestant Tribal religions
Costa Rica San José	Republic	colón	Spanish	Roman Catholic
Cuba Havana	Republic	peso	Spanish	Roman Catholic
Curaçao	See *Netherlands Antilles*, below			
Cyprus Nicosia	Republic, member of the Commonwealth of Nations	Cyprus pound	Greek, Turkish, English	Greek Orthodox Muslim
Czechoslovakia Prague	Republic	koruna	Czech, Slovak	Roman Catholic
Dahomey (Benin) Porto-Novo	Republic	C F A franc	Sudanic, French	Tribal religions Muslim
Denmark Copenhagen	Constitutional monarchy	krone	Danish	Protestant
Djibouti Djibouti	Republic (formerly French Territory of the Afars and the Issas)	Djibouti franc	Arabic, Cushitic	Muslim Tribal religions
Dominica Roseau	Republic, member of the Commonwealth of Nations	East Caribbean dollar	English, French patois	Roman Catholic
Dominican Republic Santo Domingo	Republic	peso	Spanish	Roman Catholic
Easter Island (Rapa Nui)	Possession of Chile	Chilean peso	Polynesian dialect, Spanish	Roman Catholic
Ecuador Quito	Republic	sucre	Spanish, Quechua, Jíbaro	Roman Catholic
Egypt, Arab Republic of Cairo	Republic	Egyptian pound	Arabic, English	Muslim Christian
Ellice Islands	See *Tuvalu*, below			
El Salvador San Salvador	Republic	colón	Spanish	Roman Catholic
England and Wales	Part of the United Kingdom of Great Britain and Northern Ireland	pound	English, Welsh	Protestant
Equatorial Guinea Malabo (Santa Isabel)	Republic (formerly Fernando Po and Río Muni)	ekuele	Spanish, Bubi	Roman Catholic
Ethiopia Addis Ababa	Republic	birr	Amharic, Somali, Arabic, English	Coptic Christian Muslim
Falkland Islands Stanley	British dependency	Falkland Islands pound	English	Protestant Roman Catholic
Fiji Suva	Independent self-governing member of the Commonwealth of Nations	Fiji dollar	English, Fijian, Hindustani, Chinese	Protestant Roman Catholic Muslim, Hindu
Finland Helsinki	Republic	markka	Finnish, Swedish, Lapp	Protestant
France Paris	Republic	franc	French	Roman Catholic
French Guiana Cayenne	Overseas department of France	French franc	French	Roman Catholic
Gabon Libreville	Republic	C F A franc	Bantu, French	Tribal religions Christian
Gambia Banjul (Bathurst)	Republic, member of the Commonwealth of Nations	dalasi	Sudanic, English	Muslim Tribal religions Christian
Gambier Islands	See *Polynesia, French*, below			
Germany Bonn, West Germany Berlin, East Germany	Country divided into a democratic republic in the west and a communist republic in the east	West German and East German Deutsche mark	German	Protestant Roman Catholic

Political Division and Capital City	Political Status	Monetary Unit	Language	Religion
Ghana Accra	Republic, member of the Commonwealth of Nations	cedi	Sudanic, English	Muslim Tribal religions Protestant Roman Catholic
Gibraltar	Internally self-governing British dependency	Gibraltar pound	English, Spanish	Roman Catholic
Gilbert Islands	See *Kiribati*, below			
Great Britain and Northern Ireland, United Kingdom of London	Constitutional monarchy comprising Northern Ireland and Great Britain, i e , England, Wales, and Scotland, member of the Commonwealth of Nations	pound	English, Welsh, Gaelic	Protestant Roman Catholic
Greece Athens	Republic	drachma	Greek	Greek Orthodox
Greenland Godthaab	Integral part of the Danish kingdom	krone	Danish, Greenlandic	Protestant
Grenada Saint George's	Independent self-governing member of the Commonwealth of Nations	East Caribbean dollar	English	Protestant
Guadeloupe Basse-Terre	Overseas department of France	French franc	French, French patois	Roman Catholic
Guam Agaña	Unincorporated Territory of the United States	U S dollar	English, Chamorro, Spanish	Roman Catholic
Guatemala Guatemala	Republic	quetzal	Spanish	Roman Catholic
Guinea Conakry	Republic	syli	Sudanic, French	Tribal religions Muslim
Guinea-Bissau Bissau	Republic (formerly Portuguese Guinea)	peso	Sudanic, Portuguese	Tribal religions Roman Catholic
Guyana Georgetown	Republic, member of the Commonwealth of Nations (formerly British Guiana)	Guyana dollar	English	Protestant
Haiti Port-au-Prince	Republic	gourde	French, Creole French	Roman Catholic
Honduras Tegucigalpa	Republic	lempira	Spanish	Roman Catholic
Hong Kong Victoria	British dependency	Hong Kong dollar	Chinese, English	Confucianist Buddhist Christian
Hungary Budapest	Republic	forint	Hungarian	Roman Catholic Protestant
Iceland Reykjavík	Republic	króna	Icelandic	Protestant
India New Delhi	Republic, member of the Commonwealth of Nations	rupee	Indo-Aryan (Hindi, Bengali, Gujarati, Punjabi, Urdu) Dravidian (Tamil, Kanarese, Telugu) English	Hindu Muslim Christian Sikh Jain Tribal religions
Indonesia Djakarta	Republic	rupiah	Indonesian (Malay)	Muslim Tribal religions Christian Hindu Buddhist
Iran Tehran	Republic	rial	Persian, Arabic, Kurdish	Muslim
Iraq Baghdad	Republic	Iraqi dinar	Arabic, Turkish, Kurdish	Muslim
Ireland Dublin	Republic	Irish pound	English, Gaelic	Roman Catholic
Israel Jerusalem	Republic	Israeli pound	Hebrew, Arabic	Jewish Muslim

Political Division and Capital City	Political Status	Monetary Unit	Language	Religion
Italy Rome	Republic	lira	Italian	Roman Catholic
Ivory Coast Abidjan	Republic	C F A franc	Sudanic, French	Tribal religions Muslim
Jamaica Kingston	Independent self-governing member of the Commonwealth of Nations	Jamaica dollar	English	Protestant Roman Catholic
Japan Tokyo	Constitutional monarchy	yen	Japanese	Buddhist Shintoist
Jordan Amman	Constitutional monarchy	Jordan dinar	Arabic	Muslim
Kenya Nairobi	Republic, member of the Commonwealth of Nations	shilling	Swahili, English, Sudanic, Hamitic, Bantu	Tribal religions Muslim
Kiribati Tarawa	Republic, member of the Commonwealth of Nations (formerly Gilbert Islands)	dollar	English, Micronesian dialects	Traditional religions Protestant Roman Catholic
Korea P'yŏngyang, North Korea Seoul, South Korea	Country, divided into a communist republic in the north and a democratic republic in the south	won	Korean	Confucianist Buddhist Christian
Kuwait Al Kuwait	Emirate	Kuwait dinar	Arabic	Muslim
Laos Vientiane	Republic	kip	Khmer (Annamese), Lao	Buddhist
Lebanon Beirut	Republic	Lebanese pound	Arabic, French	Christian Muslim
Lesotho Maseru	Kingdom, member of the Commonwealth of Nations (formerly Basutoland)	South African rand	Bantu, Afrikaans, English	Tribal religions Roman Catholic Protestant
Liberia Monrovia	Republic	U S dollar	English, Sudanic	Christian Tribal religions Muslim
Libya Tripoli	Republic	Libyan dinar	Arabic	Muslim
Liechtenstein Vaduz	Principality	Swiss franc	German	Roman Catholic
Luxembourg Luxembourg	Constitutional grand duchy	franc	Letzeburgesch, French, German	Roman Catholic
Macao Macao	Portuguese dependency	pataca	Chinese, Portuguese	Confucianist Buddhist Taoist Christian
Malagasy Republic (Madagascar) Antananarivo	Republic	franc	French, Malagasy, Bantu	Tribal religions Roman Catholic Protestant
Malawi Lilongwe	Republic, member of the Commonwealth of Nations	kwacha	English Bantu (Nyanja, Tumbuka, others)	Tribal religions Muslim Christian
Malaysia Kuala Lumpur	Constitutional monarchy, member of the Commonwealth of Nations, formed by the union of Malaya, British North Borneo (Sabah), and Sarawak	ringgit	Malay, Chinese, English, Indonesian	Muslim Confucianist Buddhist Hindu Christian
Maldives Male	Republic	rupee	Sinhalese, Arabic, Dravidian	Muslim
Mali Bamako	Republic .	Mali franc	Sudanic, Hamitic, Arabic, French	Muslim Tribal religions
Malta Valletta	Republic, self-governing member of the Commonwealth of Nations	pound	Maltese, English	Roman Catholic
Mariana Islands	See *Pacific Islands, Trust Territory of the,* below			
Marshall Islands	See *Pacific Islands, Trust Territory of the,* below			

Political Division and Capital City	Political Status	Monetary Unit	Language	Religion
Martinique Fort-de-France	Overseas department of France	French franc	Creole French, French	Roman Catholic
Mauritania Nouakchott	Republic	ouguiya	Arabic, Hamitic, Sudanic, French	Muslim
Mauritius Port Louis	Independent self-governing member of the Commonwealth of Nations	Mauritius rupee	English, Hindustani, French	Roman Catholic
Mexico Mexico City	Republic	peso	Spanish	Roman Catholic
Monaco Monaco-Ville	Principality	French franc	French	Roman Catholic
Mongolia Ulan Bator	Republic	tugrik	Mongolian, Russian	Lamaist Tribal religions
Montserrat Plymouth	Internally self-governing British dependency	East Caribbean dollar	English	Christian
Morocco Rabat	Constitutional monarchy	dirham	Arabic, Berber, French	Muslim Roman Catholic Jewish
Mozambique Maputo (Lourenço Marques)	Republic	escudo	Bantu, Portuguese	Tribal religions Roman Catholic
Muscat and Oman	See *Oman*, below			
Namibia	See *South-West Africa (Namibia)*, below			
Nauru Yaren	Republic, member of the Commonwealth of Nations	Australian dollar	English, Micronesian, Chinese	Protestant Roman Catholic
Nepal Kathmandu	Constitutional monarchy	Nepalese rupee	Indo-Aryan, Tibetan	Hindu Buddhist
Netherlands Amsterdam, The Hague	Constitutional monarchy	gulden	Dutch	Protestant Roman Catholic
Netherlands Antilles *Willemstad*	Overseas part of the Netherlands, comprising Curaçao, Aruba, Bonaire, Saba, Saint Eustatius, and Saint Martin	Netherlands Antilles gulden	Dutch, English, Spanish, Papiamento	Roman Catholic Protestant
New Caledonia Nouméa	Overseas territory of France	C.F.P. franc	Melanesian dialects, French	Roman Catholic Tribal religions
New Guinea, Territory of	See *Papua New Guinea*, below			
New Hebrides Vila	British and French condominium	Australian dollar, New Hebrides franc	Melanesian dialects, Pidgin English, English, French	Tribal religions Protestant Roman Catholic
New Zealand Wellington	Independent self-governing member of the Commonwealth of Nations	New Zealand dollar	English, Maori	Protestant
Nicaragua Managua	Republic	córdoba	Spanish	Roman Catholic
Niger Niamey	Republic	C.F.A. franc	Sudanic, Hamitic, Arabic, French	Muslim Tribal religions
Nigeria Lagos	Federal republic, member of the Commonwealth of Nations	naira	Sudanic, Bantu, Arabic, English	Muslim Christian Tribal religions
Norfolk Island Kingston	Territory of Australia	Australian dollar	English	Protestant
Northern Ireland Belfast	Part of the United Kingdom of Great Britain and Northern Ireland	pound	English	Protestant Roman Catholic
Norway Oslo	Constitutional monarchy	krone	Norwegian	Protestant
Nyasaland	See *Malawi*, above			
Oman Muscat	Sultanate	rial Omani	Arabic	Muslim
Pacific Islands, Trust Territory of the Kolonia	U.S.-administered U.N. trust territory, comprising the Caroline Islands, the Marshall Islands, and the Mariana Islands (except Guam)	U.S. dollar	Micronesian dialects, Malayo-Polynesian, Spanish	Tribal religions Christian

Political Division and Capital City	Political Status	Monetary Unit	Language	Religion
Pakistan Islamabad	Republic	Pakistani rupee	Indo-Aryan (Urdu, Punjabi, etc)	Muslim Hindu Christian Buddhist
Panama Panamá	Republic	balboa	Spanish, English	Roman Catholic Protestant
Panama Canal Zone Balboa Heights	Territory leased from Panama by the U S to operate Panama Canal	U S dollar	English, Spanish	Protestant Roman Catholic
Papua New Guinea Port Moresby	Independent self-governing member of the Commonwealth of Nations, formed by union of Papua and the Territory of New Guinea	kina	Papuan, Pidgin English, English	Tribal religions Protestant Roman Catholic
Paraguay Asunción	Republic	guaraní	Spanish, Guarani	Roman Catholic
Peru Lima	Republic	sol	Spanish, Quechua, Aymará	Roman Catholic
Philippines, Republic of the Manila	Republic	peso	Spanish, Tagalog, Visayan, English, Malayo-Polynesian	Roman Catholic Muslim Tribal religions
Pitcairn Island Adamstown	British dependency, administered by the British high commissioner in New Zealand	Fiji dollar	English	Protestant
Poland Warsaw	Republic	zloty	Polish	Roman Catholic
Polynesia, French Papeete	Overseas territory of France, comprising the Society Islands, the Marquesas Islands, the Gambier Islands, the Tuamotu Archipelago, and the Austral Islands	C F P franc	Polynesian dialects, Marquesan, French	Tribal religions Roman Catholic
Portugal Lisbon	Republic	escudo	Portuguese	Roman Catholic
Puerto Rico San Juan	Autonomous commonwealth in association with the U S	U S dollar	Spanish, English	Roman Catholic
Qatar Doha	Emirate	Qatar riyal	Arabic	Muslim
Rapa Nui	See *Easter Island (Rapa Nui)*, above			
Réunion Saint-Denis	Overseas department of France	French franc	French	Roman Catholic
Rhodesia (Zimbabwe) Salisbury	Internally self-governing British dependency, unilaterally declared an independent republic	Rhodesian dollar	Bantu, English	Tribal religions Protestant
Rumania Bucharest	Republic	leu	Rumanian	Rumanian Orthodox Roman Catholic
Rwanda Kigali	Republic	Rwanda franc	Bantu, French	Tribal religions Roman Catholic
Sabah Kota Kinabalu	See *Malaysia*, above			
Saint Helena Jamestown	British dependency, comprising Saint Helena, Ascension, and Tristan da Cunha islands	British pound	English	Protestant
Saint Kitts-Nevis Basseterre	Internally self-governing British associated state	East Caribbean dollar	English	Christian
Saint Lucia Castries	Independent self-governing member of the Commonwealth of Nations	East Caribbean dollar	English, French patois	Roman Catholic Protestant
Saint Pierre and Miquelon Saint Pierre	Overseas department of France	French franc	French	Roman Catholic
Samoa, American Pago Pago	Unincorporated territory of the U S	U S dollar	English, Samoan	Protestant Tribal religions
San Marino San Marino	Republic	Italian lira	Italian	Roman Catholic

Political Division and Capital City	Political Status	Monetary Unit	Language	Religion
São Tomé and Príncipe São Tomé	Republic	escudo	Bantu, Portuguese	Tribal religions Roman Catholic
Sarawak Kuching	See *Malaysia*, above			
Saudi Arabia Riyadh	Monarchy	riyal	Arabic	Muslim
Scotland Edinburgh	Part of the United Kingdom of Great Britain and Northern Ireland	pound	English, Gaelic	Protestant Roman Catholic
Senegal Dakar	Republic	C F A franc	Sudanic, Arabic, French	Tribal religions Muslim Christian
Seychelles Victoria	Republic, member of the Commonwealth of Nations	Seychelles rupee	English, French	Roman Catholic
Sierra Leone Freetown	Republic, member of the Commonwealth of Nations	leone	Sudanic, English	Tribal religions Muslim Christian
Singapore Singapore	Republic, member of the Commonwealth of Nations	Singapore dollar	English, Chinese, Malay	Christian Muslim Buddhist
Society Islands	See *Polynesia, French*, above			
Solomon Islands Honiara	Independent self-governing member of the Commonwealth of Nations	dollar	Melanesian, Pidgin English, English	Tribal religions Protestant Roman Catholic
Somalia Mogadishu	Republic, formed by the union of former British Somaliland and former Somalia (Italian Somaliland)	Somali shilling	Somali, Arabic, Italian, English	Muslim Roman Catholic
South Africa Cape Town, Pretoria	Republic	rand	Afrikaans, English, Bantu	Protestant Roman Catholic Muslim Hindu
South-West Africa (Namibia) Windhoek	Administered by the Republic of South Africa under a defunct League of Nations mandate	rand	Afrikaans, German, English, Bantu	Tribal religions Christian
Spain Madrid	Monarchy	peseta	Spanish, Catalan	Roman Catholic
Spanish Sahara	Former Spanish possession, now divided between Mauritania and Morocco			
Sri Lanka	See *Ceylon (Sri Lanka)*, above			
Sudan Khartoum	Republic	Sudanese pound	Arabic, Sudanic, Hamitic, English	Muslim Tribal religions
Surinam Paramaribo	Republic	Surinam gulden	Dutch	Christian Muslim Hindu
Swaziland Mbabane	Constitutional monarchy, member of the Commonwealth of Nations	lilangeni	Bantu, English	Tribal religions Christian
Sweden Stockholm	Constitutional monarchy	krona	Swedish	Protestant
Switzerland Bern	Republic	Swiss franc	German, French, Italian, Romansh	Protestant Roman Catholic
Syria Damascus	Republic	Syrian pound	Arabic, Turkish, Kurdish	Muslim Christian
Taiwan (Formosa) Taipei	Republic, seat of government of Nationalist China	New Taiwan dollar	Chinese (Amoy dialect), Formosan	Confucianist Buddhist Taoist Christian
Tanganyika	See *Tanzania*, below			
Tanzania Dar es Salaam	Republic within Commonwealth of Nations, formed by the union of former British colony of Tanganyika and protectorate of Zanzibar	shilling	Bantu, Swahili, English	Muslim Tribal religions Christian

Political Division and Capital City	Political Status	Monetary Unit	Language	Religion
Thailand Bangkok	Constitutional monarchy	baht	Thai, Khmer, Chinese	Buddhist Tribal religions
Tibet Lhasa	Autonomous region of the People's Republic of China	yuan	Tibetan	Lamaist
Timor, Portuguese Dili	Former Portuguese overseas province, now part of Indonesia			
Togo Lomé	Republic	C F A franc	Ewe, Mina, Dagomba, Tim, French	Tribal religions Muslim Christian
Tokelau Islands Fanuafala	Territory of New Zealand	New Zealand dollar	Samoan	Protestant Roman Catholic
Tonga Nuku'alofa	Constitutional monarchy, member of the Commonwealth of Nations	pa'anga	Tongan, English	Protestant Roman Catholic
Trinidad and Tobago Port-of-Spain	Republic, member of the Commonwealth of Nations	dollar	English	Roman Catholic Protestant Hindu Muslim
Tristan da Cunha	See *Saint Helena,* above			
Tuamotu Archipelago	See *Polynesia, French,* above			
Tunisia Tunis	Republic	dinar	Arabic, French, Berber	Muslim Roman Catholic
Turkey Ankara	Republic	lira	Turkish	Muslim
Tuvalu (Ellice Islands) Funafuti	Independent self-governing member of the Commonwealth of Nations	dollar	Ellice, English	Traditional religions Christian
Uganda Kampala	Republic, member of the Commonwealth of Nations	shilling	Bantu, Sudanic, English	Tribal religions Christian
Union of Arab Emirates Abu Dhabi	Independent federation of seven states	dirham	Arabic	Muslim
Union of Soviet Socialist Republics Moscow	Federation of fifteen socialist republics	ruble	Russian, Ukrainian, Uzbek, White Russian, Tatar, Kazakh, Azerbaijani, Armenian, Georgian, Moldavian, Lithuanian, Yiddish, Tadzhik, German, Chuvash, Turkmen	Russian Orthodox Muslim
United Arab Republic	See *Egypt, Arab Republic of,* above			
United Kingdom	See *Great Britain and Northern Ireland, United Kingdom of,* above			
United States Washington, D C	Republic	dollar	English	Protestant Roman Catholic Jewish
Upper Volta Ouagadougou	Republic	C F A franc	Sudanic, French	Tribal religions Muslim
Uruguay Montevideo	Republic	peso	Spanish	Roman Catholic
Vatican City	Papal state	lira	Italian, Latin	Roman Catholic
Venezuela Caracas	Republic	bolivar	Spanish	Roman Catholic
Vietnam Hanoi	Republic	dong	Vietnamese	Buddhist Taoist Roman Catholic
Virgin Islands, British Road Town	British dependency	U S dollar	English	Christian
Virgin Islands of the U.S. Charlotte Amalie	Unincorporated territory of the U S	U S dollar	Creole English, English	Roman Catholic Protestant
Wales	See *England and Wales,* above			

Political Division and Capital City	Political Status	Monetary Unit	Language	Religion
Western Samoa Apia	Constitutional monarchy, member of the Commonwealth of Nations	tala	Samoan, English	Protestant
Yemen Arab Republic San'a	Republic	rial	Arabic	Muslim
Yemen, People's Democratic Republic of Aden	Republic	dinar	Arabic	Muslim
Yugoslavia Belgrade	Republic	dinar	Serbo-Croatian, Slovenian, Macedonian	Eastern Orthodox Roman Catholic
Zaire Kinshasa	Republic (formerly Democratic Republic of the Congo and Belgian Congo)	zaire	Bantu	Tribal religions Christian Muslim
Zambia Lusaka	Republic, member of the Commonwealth of Nations (formerly Northern Rhodesia)	kwacha	English, Bantu (Lozi, Nyanja, and others)	Christian Tribal religions
Zanzibar	See *Tanzania*, above			
Zimbabwe	See *Rhodesia (Zimbabwe)*, above			

GUIDE TO THE USE OF THE FUNK & WAGNALLS NEW ENCYCLOPEDIA

The word "guide" means to point out the way for—to direct on a course—to conduct—to lead It implies the showing of the way by one who is thoroughly familiar with the route and connotes his continuous presence or direction along the way Thus, we have called this section a guide It was written by the editors who prepared the Funk & Wagnalls New Encyclopedia, and it is intended to show the best possible way to use their newest reference work

SPECIAL GUIDEPOSTS

lightface normal type used in printing, characterized by letters of usual thickness This entire sentence except for **three boldface words** is printed in lightface

boldface. a darker "bolder" type, characterized by letters with thick heavy lines **This entire sentence except for** two words **is printed in boldface.**

italic: a special type, characterized by letters that slant upward to the right Italic is used to give emphasis to *special terms* or to indicate *foreign words or phrases*

article *or* **entry**· name given to the complete body of text dealing with a specific topic

article title. the name of the entry, always printed in **BOLDFACE CAPITAL LETTERS**

alternate title *or* **variant title.** a lesser known name of the topic, usually printed in DISTINCTIVE LIGHTFACE TYPE

subject heading: titles of different subjects discussed within an article, usually printed in **boldface.**

cross-reference: a direction to the reader to go to another article in the encyclopedia for more or related information about the topic

running head: name of the first major article in the left column on a left-hand page and the last major article in the right column on a right-hand page Running heads are printed in large capital letters and are useful aids in finding a particular entry within a volume

ORDER OF ARRANGEMENT

The articles in the encyclopedia are arranged in simple alphabetical order through each word spelled in **BOLDFACE CAPITAL LETTERS** in the entry title The alphabetical order is not affected by intervening punctuation or by spaces between the words

BIBLE
BIBLE ARCHEOLOGY
BIBLE, CANON OF THE
BIBLE, ENGLISH TRANSLATIONS OF THE
BIBLE, INTERPRETATIONS OF THE
BIBLE SCHOLARSHIP
BIBLE SOCIETY
BIBLE SOCIETY, AMERICAN
BIBLE, VERSIONS OF THE

LINCOLN, Abraham
LINCOLN, Robert Todd
LINCOLN BOYHOOD . . .
LINCOLN CENTER . . .
LINCOLN MEMORIAL
LINCOLN MONUMENT
LINCOLN, MOUNT
LINCOLNSHIRE

If different topics are known by the same name, the entries are placed in the order of things, places, and persons

MERCURY,	metallic element	[thing]
MERCURY,	smallest planet in the solar system .	[place]
MERCURY,	in Roman mythology, messenger of the gods	[personage]

THINGS

The category "things" includes every subject except persons or places If the name of a thing consists of more than one word, the word order has been inverted so that the first significant word in the name determines its alphabetical arrangement

BASEBALL HALL OF FAME AND MUSEUM, NATIONAL
JENKINS' EAR, WAR OF
MASSACHUSETTS, UNIVERSITY OF
PSYCHOLOGY, EXPERIMENTAL
STAR-SPANGLED BANNER, THE

The boldface words **A, AN,** and **THE,** when part of an inverted title do not affect the alphabetical order of the entry

ALAMO, THE, former Franciscan mission
ALAMOGORDO, town in New Mexico

Different things with the same name. When different things are known by the same name, the article about the animate thing comes before the article about the inanimate thing

CRANE, common name for the largest of wading birds [animate]

CRANE, machine for moving heavy objects [inanimate]

Related things with the same name. Things with the same name that are somewhat related have been grouped together under one title For example, see **ACT OF UNION** in this volume Each of the four acts is discussed as a separate subject marked by a **boldface subject heading.**

Terms used in more than one field. A term applicable in more than one field is sometimes discussed in a single entry For example, see **ADMIRALTY** in this volume Each sense of the title is marked by a **boldface number**

PLACES

The category "places" includes political units, for example, countries, States, and cities, and natural features, such as mountains, rivers, and capes

Duplication of place-names. Political units with the same name are arranged in the order of countries, followed by States, provinces, departments, and regions, followed by counties and shires, followed by cities, followed by boroughs, towns, villages, and smaller units Political units in the United States appear before political units elsewhere in the world In the United States, two similarly named places of equal political importance appear in the alphabetical order of their respective States

ABERDEEN, city in South Dakota

ABERDEEN, city and seaport of Washington

ABERDEEN, residential town of Maryland

ABERDEEN, Great Britain, county in N E Scotland

ABERDEEN, Great Britain, city and county town of Aberdeen County, Scotland

Places with the same name located outside the United States appear in alphabetical order by nation Ancient place-names come before modern place-names

SYDNEY, city and principal port of Australia

SYDNEY, city and seaport of Canada

CORINTH, city of ancient Greece

CORINTH, city of Greece

Natural features. Natural features with the same name follow the political units The names of natural features are entered as indicated by the following examples

CAPE OF GOOD HOPE, name of two promontories .

EVEREST, MOUNT

MICHIGAN, LAKE

NILE, river of Africa

Alternate and former names. Alternate and former place-names are printed in DISTINCTIVE LIGHTFACE TYPE in the article title

LENINGRAD, *formerly* SAINT PETERSBURG (1703–1914) and PETROGRAD (1914–24), city of the Soviet Union

THESSALIA, *commonly* THESSALY

PERSONS

The category "persons" includes (1) biographies dealing with the life of a single person, and (2) grouped biographies, that is, entries containing several biographies that, because of an important relationship, have been grouped together under the same title

In the article title of a single-person biography, the person's name is inverted so that the family, or last, name appears first The full name, including any middle names and titles of nobility, is given in boldface

CHURCHILL, Sir Winston Leonard Spencer

If a first or middle name is not commonly used, it is shown in parentheses

WILSON, (Thomas) Woodrow

If only an initial is commonly used, the remainder of the name is enclosed in parentheses

ELIOT, T(homas) S(tearns)

People with the same name. When two or more people have the same name, the entries are arranged in the following order saints, popes, emperors and kings, titled persons, families, other

Saints and popes. The biography of a saint is entered *at the saint's name* For examples, see **AGNES, Saint** in this volume and **AQUINAS, Saint Thomas** in Volume 2 Important popes having the same name have been grouped in chronological order under a single title, that of their pontifical name For example, see **ALEXANDER** in this volume

Emperors and kings. Important rulers with the same name are grouped together under one title, that of their given name A grouped-ruler entry is first sectioned alphabetically by kingdom or country Within each of these political divisions, the rulers are then arranged chronologically For example, see **ALFONSO** in this volume

Rulers of great historic importance also have separate more detailed articles Readers may consult the grouped-ruler entry first It will either itself contain complete biographical information or indicate that a special separate biography on the ruler follows

Families and dynasties. Famous members of a family or a dynasty have been grouped chronologically under one article title, that of the family or dynastic name For example, see **KENNEDY** in Volume 15 Every President of the United States, however, has his own separate biography, see **KENNEDY, John Fitzgerald,** also in Volume 15

Pseudonyms. A biography of a person known by a pseudonym may be entered at either the subject's real name or his pseudonym A cross-reference from the lesser known name to the better known ensures the reader's finding the biography

TWAIN, Mark. *See* CLEMENS, SAMUEL LANGHORNE

Confusing spellings. Names beginning *Al, El, De, Della, Du, Des, L', La, Le, Les, Van,* and *Von* have been entered according to the accepted usage, the reader should look under each possibility Names beginning *M', Mac,* and *Mc* have been entered appropriately into the simple alphabetical order of the encyclopedia

FINDING FACTS

The articles in the encyclopedia are organized so that one entry offers the same kind and order of information as another article in the same field Articles on similar political units are alike in their structure, for example, the pattern of the **ALABAMA** article corresponds to that used for each of the other forty-nine States Similarly, articles dealing with plant and animal life parallel each other in scheme, the description of **MAPLE** can be compared with that of **OAK,** and the coverage of **RABBIT** with that of **SQUIRREL.** Patterns have been followed also for the other sciences and for religious, political, and biographical articles

Alternate names and variant spellings If a topic is known by different names or by a name having different spellings, the more widely used names or spellings appear in **BOLDFACE CAPITAL LETTERS** in the article title Lesser known names or spellings are also shown in the title but are printed in DISTINCTIVE LIGHTFACE TYPE

AIR-CUSHION VEHICLE, *or* GROUND-EFFECT MACHINE *or* HOVERCRAFT

When different names or spellings appear all in **BOLDFACE TYPE** in the title, it indicates either that both names are widely known or that no special spelling of the name is preferred

LEIDEN *or* **LEYDEN,** one of the oldest cities in Holland

Word derivations. Frequently the derivation of a word is important in understanding its meaning and use Word derivation in an entry usually shows the language from which the English word is derived and a literal translation of the foreign word

TELEPATHY (Gr *tēle,* "far", *patheia,* "feeling")

Subject headings. Subject headings are used to divide longer articles into compact sections Printed in **boldface,** subject headings indicate where the article turns from one aspect of the topic to another The reader can usually find desired specific information by looking for the appropriate subject heading within the entry

Abbreviations and accents. The abbreviations found in the text are commonly used abbreviations, an explanatory list appears in the front of *each* volume A more extended listing, showing abbreviations widely used by authoritative sources in many fields, can be found in the article **ABBREVIATION.** Pertinent charts of abbreviations also accompany the articles, **BIBLE, CANON OF THE; DEGREE, ACADEMIC; ELEMENTS, CHEMICAL; MATHEMATICAL SYMBOLS; WEIGHTS AND MEASURES.** Accent marks and special letters are explained in the article **DIACRITIC MARK.**

Immediate identification of people. Every person mentioned in the text of an article is immediately identified by his nationality and his profession or accomplishments The names of people who are not themselves the subject of a separate biography in the encyclopedia are followed by specific or approximate life dates given in parentheses

Signature. The set of initials or name of an organization appearing on the last line of many of the entries is called the signature It denotes the specialist who participated in the preparation of the article The identity of all initials is explained in the *Key to Signed Articles* in the front of volume 1

CROSS-REFERENCES

Much careful attention was given to devising the best system of cross-references for the encyclopedia Cross-references insure the reader's awareness of all other entries also pertaining to the article topic Wherever possible, the cross-reference has been slotted into the precise spot in the article where a reading of the suggested entry would be most beneficial

Readers are directed to separate entries by the italicized words *see, see also,* or *see under* followed by the ARTICLE TITLE IN DISTINCTIVE TYPE The article title, in turn, may frequently be followed by the specific *subject heading,* in italic type, under which the reader will find the intended supplementary information

In many mammals the color of the skin or fur blends with the animal's natural surroundings, *see* ADAPTATION *Protective Coloration*

What does (q.v.) mean?

The abbreviation (q v) stands for the Latin words "quod vide", meaning "which see" The placement of this abbreviation immediately after a word—or a name or term—signals that the word itself is the title of a separate article in the encyclopedia By looking up the article on this word, or the entries on each word in a series followed by the plural (qq v) of the abbreviation, the reader will find specific information about the words used and additional data about the main topic of the article he is reading

ILLUSTRATIONS

Whenever possible a blend of text and illustrations has been used in the encyclopedia articles Photographs were selected either to help explain the topic or to extend the text of an article even further In many of the technical and scientific entries, special diagrams were drawn to coordinate with the text

INDEX AND BIBLIOGRAPHY

The last two volumes of the encyclopedia comprise an index to the text and a supplementary bibliography The index, of course, is the key to unlocking the encyclopedia Checking a topic there first, rather than searching randomly through the volumes, will quickly bring an elusive fact to the reader The bibliography points to information outside the encyclopedia, describing about 8000 books and periodicals for further reading or extended study of a topic

LIST OF ABBREVIATIONS USED IN THE TEXT*

abbr.	abbreviated
AC; a-c	alternating current
A.D.	*anno Domini* (Lat , in the year of the Lord)
alt.	altitude
A.M.	*ante meridiem* (Lat , before noon)
AM	amplitude modulation
amu *or* **AMU**	atomic mass unit
anc.	ancient
Ar.	Arabic
AS.	Anglo-Saxon
A.S.S.R.	Autonomous Soviet Socialist Republic
at.no.	atomic number
at.wt.	atomic weight
b.	born
bbl	barrel
B.C.	before Christ
bd.ft.	board feet
bev *or* **BeV**	billion electron volts
b.p.	boiling point
B.T.U.	British Thermal Unit
bu.	bushel
Bulg.	Bulgarian
C.	centigrade
cent.	century
Chin.	Chinese
cm	centimeter
Co.	County
colloq.	colloquial
cu.	cubic
Czech.	Czechoslovakian
d.	died
Dan.	Danish
DC; d-c	direct current
Du.	Dutch
E.	east, eastern
ed.	edition, editor
Egypt.	Egyptian
Eng.	English
est.	estimated
ev *or* **EV**	electron volt
F.	Fahrenheit
fl.	flourished
FM	frequency modulation
fr.	from
Fr.	French
ft.	foot
g	gram
Gael.	Gaelic
gal	gallon
Ger.	German
Gr.	Greek
Heb.	Hebrew
Hind.	Hindustani
h.p.	horsepower
hr.	hour
Hung.	Hungarian
Hz	hertz or cycles per second
I.	Island
i.e.	*id est* (Lat , that is)
in.	inch
Ind.	Indian
Ir.	Irish
It.	Italian
K.	Kelvin
kg	kilogram
kHz	kilohertz
km	kilometer
kw	kilowatt
kw hour	kilowatt hour
lat.	latitude
Lat.	Latin
lb.	pound
long.	longitude
m	meter
M.	Middle
mev *or* **MEV**	million electron volts
mg	milligram
MHz	megahertz
mi.	mile
min.	minute
M.L.	Medieval Latin
mm	millimeter
mod.	modern
m.p.	melting point
m.p.h.	miles per hour
Mt(s).	Mount, Mountain
N.	north, northern
Norw.	Norwegian
N.T.	New Testament
OE.	Old English
OF.	Old French
OHG	Old High German
ON.	Old Norse
ONF.	Old Norman French
O.T.	Old Testament
oz.	ounce
P.M.	*post meridiem* (Lat , after noon)
Pol.	Polish
pop.	population
Port.	Portuguese
prelim.	preliminary
pron.	pronounced
q.v.	*quod vide* (Lat , which see)**
r.	reigned
R.	River
rev.	revised, revision
R.R.	railroad
Rum.	Rumanian
Russ.	Russian
Ry.	railway
S.	south, southern
sec.	second
S.F.S.R.	Soviet Federated Socialist Republic
Skr.	Sanskrit
Sp.	Spanish
sp.gr.	specific gravity
sq.	square
sq.mi.	square mile
S.S.R.	Soviet Socialist Republic
St.; Ste.	Saint
Sum.	Sumerian
Sw.	Swedish
temp.	temperature
trans.	translation
Turk.	Turkish
U.K.	United Kingdom
U.N.	United Nations
U.S.	United States
U.S.A.	United States of America
U.S.S.R.	Union of Soviet Socialist Republics
var.	variant
vol.	volume
vs.	versus or against
W.	west, western
yd.	yard

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*For a more extensive listing of abbreviations, widely used by authoritative sources in many fields, *see* ABBREVIATION Charts of pertinent abbreviations also accompany the articles BIBLE, CANON OF THE, DEGREE, ACADEMIC, ELEMENTS, CHEMICAL, MATHEMATICAL SYMBOLS, and WEIGHTS AND MEASURES Accent marks and special letters are explained in the article DIACRITIC MARK

**The abbreviation (q v) stands for the Latin words "quod vide", meaning "which see" The placement of this abbreviation after a word—or a name or term—indicates that the word itself is the title of a separate article in the encyclopedia By looking up the article on this word, or the entries on each word in a series that is followed by the plural form (qq v) of the abbreviation, the reader will find specific information about the words used as well as data about the main topic of the article he is reading

eho 3 2 1

Aa

A, first letter and first vowel of the English alphabet It also is the first letter of most alphabets which, like those of English and other Indo-European languages, are derived from the ancient Semitic scripts of the Middle East In certain Indian and Ethiopic alphabets its position is different

The history of the transmission of this letter from alphabet to alphabet is still unclear The ancient Semitic character from which the modern A derives was once thought to be a Phoenician invention In the mid-19th century A was traced to older sources in Babylonian and Cretan inscriptions and in Egyptian hieratic and hieroglyphic scripts (*see* HIEROGLYPHICS)

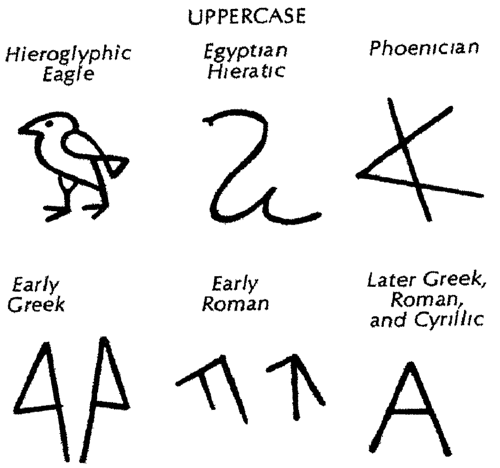
The A-shape apparently originated in a hieroglyphic picture of an eagle, which was called *ahom* in the old Egyptian picture-writing language. The sign later was borrowed by the Phoenicians or other Semites from Egyptian cursive hieratic writing, a rounded, flowing form of script in which the letter A had lost its resemblance to the eagle hieroglyph. Its changed appearance led the Phoenicians to rename the letter *aleph* ("ox"), from a fancied resemblance to the head and horns of that animal

In the Phoenician and other early Semitic alphabets the character *aleph* was a consonant and represented a glottal stop. These early alphabets had consonants only, the presence of vowel sounds or values had to be inferred by the reader At a later period vowel points, that is, marks placed below, above, or to the side of the consonant symbol, were used to indicate vowel values. When the Semitic alphabet was adopted by the Greeks in the 9th century B C certain Semitic consonant symbols were made to represent vowel sounds In the earliest Greek alphabet *aleph* became the letter *alpha,* with the value of the long or short *ah* sound.

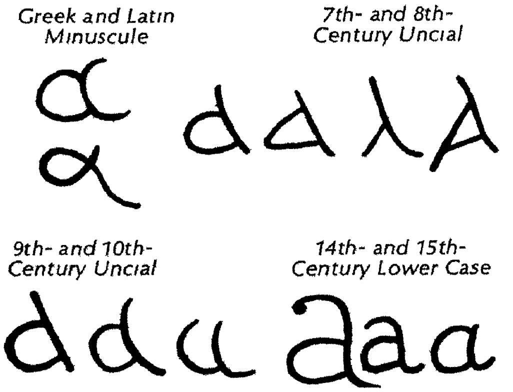
In the 7th century B C the Romans adopted the Greek alphabet with modifications The Greek letter *alpha* became the Roman A, and this form and its general value were passed on to the peoples who later adopted the Roman alphabet In the 9th century A D the Greek *alpha* was incorporated in the Cyrillic alphabet (q v) devised by Byzantine missionaries for the Slavic-speaking peoples whom they had converted to Christianity

The evolutions of the three forms of the letter now in use in English, namely the capital, the Roman lower case, and the italic and script lower case, began at different dates The English capital A is identical with the Greek and Roman forms of A used in stone carvings It conforms more closely than do the A's of other alphabets to the primitive Phoenician outline found in inscriptions of the 9th century B C The English lowercase italic and script a is derived from the Greek and Latin uncial script, a kind of large, rounded lettering used as early as the 3rd century B C The uncial script A was also the parent form of the Greek minuscule A In the Caroline minuscule, a form of lettering derived from the Greek minuscule and used chiefly in manuscripts such as those produced in the Frankish Empire in the 9th century A D, the head of the letter was bent to the left to avoid possible confusion with the uncial letter d, the a form was the result The Frankish manuscripts were studied by 14th-century typeface designers, who preserved the bent form. It survives in the so-called Roman lowercase type commonly used in modern printed books The gradual evolution of the letter A may be summarized as shown in the illustration on page 86

The earliest known sound represented by a is that of the **a** in father, it was the sound of the ancient Greek *alpha* This *ah* sound, often called the Italian a, is also the name of the letter itself in Latin and in all the modern European languages except English In English not only the name of the letter but the sounds for which it



The probable line of evolution of italic and lowercase letters is as follows


Greek and Latin Minuscule
7th- and 8th-Century Uncial
9th- and 10th-Century Uncial
14th- and 15th-Century Lower Case

stands have changed greatly, particularly during and since the Middle English period (1100–1500 A D) Presently the sound of the a in "late" is the name of the letter in English The English a may indicate many distinct sounds, the chief of which appear in "ale", "care", "chaotic", "add", "account", "arm", "ask", and "sofa" The a sound in "lay" and "hate" is known in modern English as long a, and the a in "fast" and "bat" is known as short a Modifications of the value or sound of a appear also in numerous other modern languages, some of which indicate the modified value by a superscript character, that is, a mark placed above the letter Typical examples include ă in Rumanian, â in French, ã in Portuguese, and å in Swedish

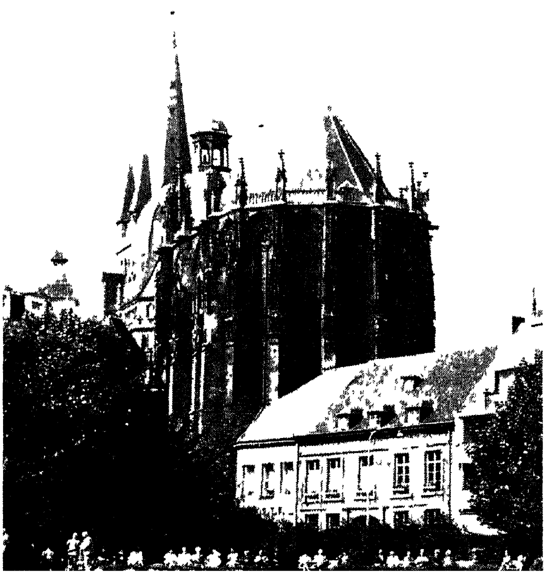
The capital A is a much-used abbreviation for many words of which it is the initial letter In academic degrees, it represents *artium* ("of arts"), as in A B (*artium baccalaureus*), bachelor of arts It also represents *anno,* as in A D (*anno domini,* the year of our Lord) In the law of the New England Puritans from 1658 to 1785 the letter A was the badge of a convicted adulteress In chemistry, A is the symbol for argon, in physics it stands for absolute temperature, in spectroscopy it is one of the Fraunhofer lines (q v) produced by oxygen The symbol Å stands for angstrom, a unit of wavelength in physics In music, A is the sixth note of the diatonic scale (*see* SCALE) and is usually the standard note to which instruments are tuned In medieval Roman numerals, A stood for 50 or for 500, and the form Ā stood for 5000

The lowercase a stands for ampere in electricity, for acre and also for are as units of measurement, and, in logic, for a given affirmative proposition

The symbol A1, indicating excellent or outstanding quality, has spread from the shipping industry, in which it originated, to other fields. In finance certain capital shares, whether of common or of preferred stock, which take precedence over other shares in their class, are designated as Class A stock The capital or lowercase letter is often employed as a symbol to denote a first division or subdivision of a classification, schedule, statement, or summary

AACHEN (Fr *Aix-la-Chapelle*), city of West Germany, in the State of North Rhine-Westphalia, about 40 miles S W of Cologne The W boundary of Aachen adjoins the Belgian border The city is rich in historical associations, and is thought to have been the birthplace of Charlemagne (q v), Emperor of the West During his

The cathedral at Aachen rises behind the city's spacious Elisengarten German Information Center



reign Charlemagne made the city a center of Carolingian culture, and had his palace and cathedral erected in Aachen The Holy Roman emperors were crowned in the city from 813 to 1531 During the French Revolution (q v) Aachen was occupied by the French and in 1801 was formally ceded to France After the defeat of Emperor Napoleon I (q v) in 1815 in the Napoleonic Wars (q v), Aachen was acquired by Prussia

Aachen is known for its excellent mineral springs and has been a health resort since the 1st century A D The city is an important railroad junction and industrial center The major manufactures are machinery, processed foods, railroad cars, and textiles Noteworthy structures include the town hall, built in 1353 on the ruins of Charlemagne's palace, and the cathedral, rebuilt in the 10th century, which contains Charlemagne's tomb Pop (1971) 175,500

AALBORG (anc *Alburgum*), city and seaport in Denmark, capital of Nordjylland County, in the N E portion of the Jutland Peninsula, on the S shore of the Limfjorden, about 60 miles N W of Aarhus The chief products manufactured in Aalborg are cement, tobacco products, and liquor Founded early in the 11th century, the city has been an episcopal see since 1554 Nearby is Rebild National Park, a memorial to Danish-American friendship dedicated in 1912 Pop (1970) 100,255

AALTO, (Hugo) Alvar Henrik (1898–1976), Finnish architect, born in Kuortane and educated at the Technical University, Helsinki He opened an architectural office in Helsinki in 1923 and worked there continuously, except from 1946 to 1948 when he was professor of architecture at Massachusetts Institute of Technology Aalto designed many bold and dramatic public buildings in his native Finland, among them the Culture House (1958), Helsinki He also created the highly regarded designs for the Finnish pavilions at the world's fairs in Paris (1937) and New York City (1939), a famous serpentine dormitory (1947–48) at Massachusetts Institute of Technology, and the library (1970) of Mount Angel Abbey, a Benedictine monastery near Portland, Oreg. Aalto achieved wide recognition in the 1930's as a furniture designer for his work with laminated wood, especially for chairs he planned to conform to body contours; *see* FURNITURE

AAR. *See* AARE

AARDVARK (Afrikaans, "earth pig"), common name for a burrowing, ant-eating mammal, *Orycteropus afer,* constituting the order Tubulidentata The aardvark is found throughout much of Africa, from the southern part of Egypt to the Cape of Good Hope A nocturnal animal, it lives in burrows and feeds entirely on ants and termites

African aardvark, Orycteropus afer
John B Dobbins—National Audubon Society

The aardvark is about 5 to 6 ft long and has an arched back, a tubular snout, large, upright ears, and a fleshy, tapering tail which it uses to throw earth back when it burrows The aardvark uses its specialized, chisel-shaped claws to break open the hard clay of termite nests, then the aardvark uses its sticky tongue to capture the insects in the nest Unlike other anteaters, which are toothless, the aardvark has twenty cylindrical, rootless teeth which grow continually throughout its lifetime, *see* ANTEATER

The female gives birth to a single offspring, which digs its own burrow at the age of six months Although timid, the aardvark will fight when it cannot flee or burrow to safety, lying on its back, it defends itself with its extremely powerful claws

AARDWOLF, *or* EARTH WOLF, common name for a carnivorous quadruped, *Proteles cristatus,* of southern and eastern Africa, usually placed with the hyenas in the family Hyaenidae Unlike the hyena (q v), which has only four toes on its forefeet, the aardwolf has five, for this reason it sometimes is placed in a family of its own, Protelidae The aardwolf stands about 20 in high at the shoulder, is about 2½ ft long, and is covered with long, coarse hair It is light buff in color, with an orange tint and dark-brown bands At night it leaves its burrow, traveling singly or in a troop, to forage for carrion and insects, especially termites When attacked, the aardwolf erects its mane, achieving a formidable appearance, and ejects a foul-smelling fluid from its anal gland Having weak jaws and small teeth, however, it is unable to fight off such enemies as the dog. Toward December the female aardwolf finds a burrow and bears a litter of two to four young

AARE, *or* AAR (anc *Obringa*), third-largest river in Switzerland The source of the Aare is in Bern Canton After flowing through the lakes of Brienz and Thun, the river joins the Rhine R near the town of Waldshut, Germany The main tributaries are the Reuss and the Limmat It is about 175 mi long and is navigable from the mouth to the town of Thun, Switzerland

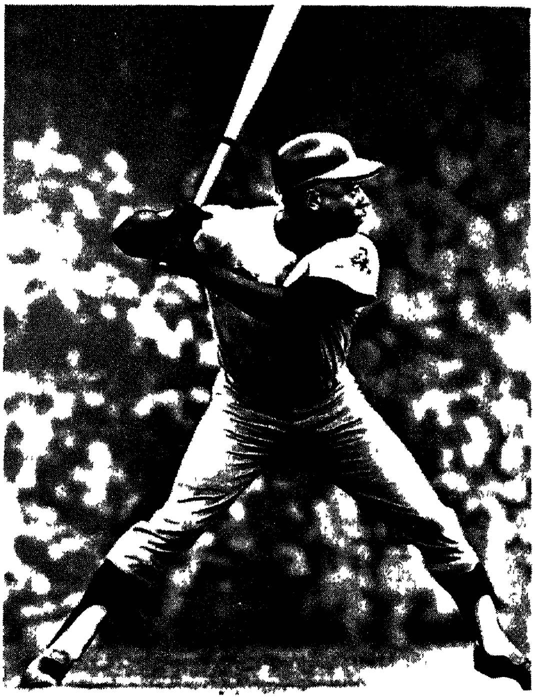
AARHUS (Dan *Århus*), seaport and second-largest city of Denmark, capital of Aarhus County, on the E coast of the Jutland Peninsula, about 60 miles S E of Aalborg The city has an excellent harbor and is an important trading and shipping center It is the seat of Aarhus University Major industries include shipbuilding and the manufacture of locomotives, machinery, and oil products Pop (1970) 198,980

AARON (fl about 1300 B C), first Jewish high priest, and traditional founder of the Hebrew priesthood, *see* HIGH PRIEST According to the Old Testament book of Exodus, Aaron was the older brother of Moses, and a direct descendant of the tribe of Levi (qq v.). When Moses declined the mission of delivering the Children of Israel from Egyptian bondage, because he was "slow of speech", Aaron was appointed his minister and spokesman (Exod 4 10–15) He delivered the message of Jehovah to the Israelites and to the court of the Pharaoh, confirming the words of the message by wonderful signs (Exod 4–12) With Moses, Aaron led the Israelites out of Egypt, and in the battle against the Amalekites (Exod 17), Hur and Aaron held up the hands of Moses while he prayed for victory Aaron was specially chosen for the office of priest, which was to be hereditary in his family (Exod. 28), and was formally consecrated At Mt Sinai, when Moses and Joshua ascended the mount to receive the stone tablets containing the Law, Aaron and Hur were left in charge of the Israelites. The people, dismayed at Moses' long absence on the mountain, cried out for a god to worship, and Aaron made them a golden calf (Exod 32.1–24); he thereby incurred the anger of Jehovah, and was pardoned only through the intercession of Moses For their doubts (Num 20), Moses and Aaron were forbidden to enter the promised land, Aaron died on Mt Hor, and his office was given to his son Eleazar

AARON, Henry L., popularly known as HANK AARON (1934–), American athlete, born in Mobile, Ala In 1951, when he was seventeen years old and a member of the Indianapolis, Ind., Clowns professional baseball team, Aaron was signed by the Braves (then of Milwaukee, Wis , after 1966, of Atlanta, Ga) In 1954, after three seasons in the minor leagues, he began his major-league career Aaron, a right fielder, became the highest paid player in the history of professional baseball in 1972, when he signed a new three-year contract awarding him a reported total of $600,000 On April 8, 1974, he hit his 715th home run, topping the 714 of George Herman Ruth (q v), to become the greatest all-time home-run hitter In November, 1974, Aaron was traded, at his own request, to the Milwaukee (Wis) Brewers He retired after the 1976 season with 755 home runs

AASEN, Ivar Andreas (1813–96), Norwegian philologist and writer, born in Örsen By 1843 he had published a collection of folk songs in the dialects of his Romsdals fjord area This, with his philological research, was aimed at displacing the Danish influence on the Norwegian language. In 1853 he created *nynorsk,* "New Norse" or "New Norwegian", as a literary language, from the rural dialects mainly of his own western district The Norwegian parliament later decreed that *nynorsk* was an official language *See* NORWEGIAN LITERATURE

ABA, city of Nigeria in Rivers State, on the Aba R , 35 miles N E of Port Harcourt Aba is served by a railroad, and is a road center as well, dealing in palm oil and kernels, and the processing of cola nuts Originally a small village adjacent to a British military camp, the city has be-



Henry L ("Hank") Aaron at bat UPI

come an important trade center Manufactures include textiles, soap, pharmaceuticals, shoes, beer, and mineral water Pop (1972 est) 500,000

ABACÁ. *See* Manila Hemp

ABACUS, instrument used in performing arithmetic calculations It consists essentially of a tablet or frame bearing parallel wires or grooves on which counters or beads are moved In the present-day abacus, each wire or groove represents one place in the system of notation (that is, units, tens, hundreds, thousands), and each bears two groups of counters, one of five counters, each representing one unit, and one of two counters, each representing five units The abacus was used in many early civilizations In the ancient Roman culture it was a sand-covered wax tablet, marked table, or grooved table or tablet In China and Japan, where it is still used, it is a frame with beads strung on parallel wires A simplified form of abacus was used in medieval England It consisted of a tablet ruled into spaces representing the positions of the counters, coins, buttons, stones, or other small objects were moved to make the calculations. The checkered tablecloth, from which the Exchequer (q v) of England derives its name, was originally a calculating device like the ruled tablet

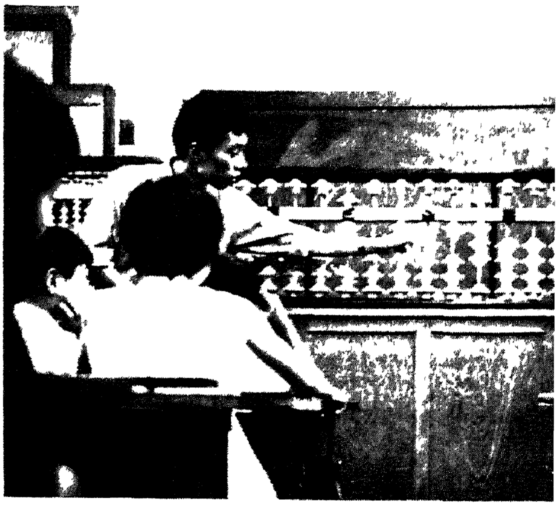
ABAD. *See* Abbad

ABADAN, city of Iran, on Abadan Island, in Khuzistan Province, in the delta of the Shatt-al-Arab R , about 260 miles S E of Isfahan Crude oil from outlying oilfields is pumped to the city through pipelines Abadan is one of the most important petroleum-refining and petroleum-shipping centers in the world Pop (1972 est) 400,000

ABALONE, *or* EAR SHELL *or* ORMER, common name for any marine gastropod mollusk in the family Haliotidae, found on rocks near the shores of all warm seas except the western Atlantic Ocean Abalones feed on seaweed They have flattened, ovoid shells, sometimes a foot long, which are used in the manufacture of decorative objects The thick muscle, or foot, with which the abalone firmly attaches itself to a rock, is edible The flesh is sometimes served fresh, but is usually dried The red abalone, *Haliotis refescens,* is found in large numbers off the coast of California.

ABANDONMENT. For the abandonment of goods, *see* Derelict, Salvage For the desertion of children, *see* Parent and Child For abandonment as grounds for altering the marriage relationship, *see* Desertion, Divorce, Husband and Wife, Separation

ABARBANEL. *See* Abrabanel



The use of the abacus, perhaps man's first "computer", is demonstrated by a teacher in Tokyo The abacus is still used as a calculator in many parts of China and Japan

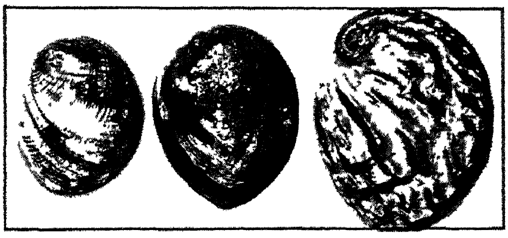
ABATE. *See* Abbate, Niccolo Dell'.

ABATEMENT, in law, form of dilatory defense or plea that ends an action in law or equity on grounds that a technical error of fact prevents continuation of the action *See* Law *Equity* When used in an action in law, the proceeding is ended and the plaintiff must institute a new suit to pursue the case In equity, the action may be undertaken again after correction of the error of fact Abatement, when applied in contracts, debts, legacies, customs duties, and taxes, means a reduction in the payable sum Applied to nuisances, abatement signifies removal of the cause

ABATI. *See* Abbate, Niccolo Dell'

ABBAD *or* **ABAD,** name of three Muslim rulers in Spain

Abbad I, in full 'ABBAD IBN-MUHAMMAD ABU-AMR (d 1042), founder of the Abbadid dynasty of Seville In 1023 Abbad, who was then a magistrate in Seville, seized power in the city, proclaimed independence from the Western Caliphate (*see* Caliph), and established a separate kingdom He ruled until 1042



Abalone shells with outer covering removed

American Museum of Natural History

Abbad II, in Arabic AL-MU'TADID (d 1068), King (1042–68), son of Abbad I. He was a poet and a patron of the arts During part of his reign he paid tribute to Ferdinand I (q v), King of Castile

Abbad III, in Arabic AL-MU'TAMID (d 1095), King (1068–91), son of Abbad II Early in his reign he seized Córdoba, seat of the Western Caliphate He later became involved in war with the Christians of Castile and defeated them in 1086 with the help of the Muslims of Africa, *see* SPAIN *History* In 1091 he was deposed and exiled by the African Muslims Abbad died later in Africa

ABBAS, in full AL-ABBAS IBN-'ABD-AL-MUTTALIB (566?–652), merchant of Mecca and a paternal uncle of the Prophet Muhammad (q v) Abbas became one of the chief apostles of Islam Abu-al-Abbas (721?–54), one of his descendants, was the founder of the Abbassids, the second dynasty of caliphs *See* CALIPH

ABBAS I (1813–54), Pasha of Egypt (1849–54), grandson of the pasha Mehemet Ali (q v) In 1848, on the death of his uncle Ibrahim Pasha (q v), Abbas became regent of Egypt He was created pasha in the following year Most of the domestic reforms accomplished by Mehemet Ali were destroyed during the reign of Abbas, who was murdered by his slaves.

ABBAS II, in full ABBAS HILMI PASHA (1874–1944), last khedive (Turkish viceroy) of Egypt He succeeded his father Tewfik Pasha (1852–92) on the throne of Egypt in 1892 During the early years of his reign he opposed British interference in Egyptian affairs After 1900, however, he was compelled to cooperate with progressive measures instituted by the British resident at Cairo During his reign Egypt reconquered the Sudan in 1898, in 1899 the railway to Khartoum, Sudan, and in 1902 the Aswân Dam were completed Abbas II supported the Ottoman Turks in World War I and was deposed in 1914, when Great Britain established a protectorate over Egypt

ABBAS I, known as ABBAS THE GREAT (1557?–1628), Shah of Persia (1586–1628) He recovered much of the land that the Turks had won from Persia. At his death the Persian dominions extended from the Tigris R to the Indus R *See* PERSIA, TURKEY *History*

ABBAS, Ferhat. *See* ALGERIA· *History*

ABBASIDS. *See* CALIPH

ABBATE, Niccolo Dell' *or* **ABATE, Nicolo Dell'** *or* **ABATI, Niccolo Dell'** (1512?–71), Italian painter, born and trained in Modena The greater part of his early work, done in Modena and Bologna, has been lost. About 1552 Abbate settled in France, where he lived for the remainder of his life He became assistant to the Italian painter Francesco Primaticcio (1504–70) and later succeeded him as chief artist at the palace of Fontainebleau (q v), residence of the kings of France The surviving frescoes and decorative paintings at Fontainebleau probably are the most famous of Abbate's works Other works are in Florence, Bologna, Rome, Paris, Vienna, and Dresden

ABBE, Cleveland (1838–1916), American astronomer and meteorologist, born in New York City, and educated at Free Academy (now The City University of New York) and the University of Michigan In 1867 he became director of the observatory at Cincinnati, where he initiated a system of daily weather forecasts In 1871 he joined the newly established Weather Bureau of the Federal government. He initiated the American system of standard time and hourly meridians, *see* TIME Abbe was professor of meteorology at Washington University (1886–1905) and at Johns Hopkins University in Baltimore (1896–1914), and was founder of the Abbe Meteorological Library of the Johns Hopkins University He wrote many works on the subject of meteorology

ABBESS, woman who is superior of a convent in certain religious orders An abbess has administrative jurisdiction equivalent to that of the abbot (q v.) of a monastery, but does not exercise the rights and duties of the priesthood The title dates from the 6th century Most of the original secular privileges of the position, such as membership in the king's council and rank of nobility equivalent to that of temporal peers, were abolished in the 16th century, at the time of the Reformation

ABBEVILLE, town in Louisiana, parish seat of Vermilion Parish, on the Vermilion R , about 62 miles s w of Baton Rouge The town is in an area that grows rice, cotton, sugarcane, and corn. Abbeville is a milling and distributing center for the agricultural products, and also has sugar refineries and fish canneries. Oil wells are nearby. Pop. (1960) 10,414, (1970) 10,996

ABBEY, self-sufficient monastic house ruled by an abbot or an abbess, *see* MONASTICISM *Abbeys.*

ABBEY, Edwin Austin (1852–1911), American illustrator and mural painter, born in Philadelphia, Pa , and trained at the Pennsylvania Academy of Fine Arts. In 1878 he was sent to England by the periodical *Harper's Weekly* to make studies for illustrations of *Poems* by the English poet Robert Herrick (q v) Abbey then did the illustrations for *She Stoops to Conquer* (1887),

selections from the poetry of Robert Herrick with Drawings by Edwin A. Abbey
Harper & Brothers—Publishers Franklin Square New York

Title-page illustration by Edwin Austin Abbey for Robert Herrick's Poems

by the British writer Oliver Goldsmith (q v), and for comedies of William Shakespeare Among his best-known watercolors are "The Evil Eye" (1887) and "An Old Song" (1886) His first oil painting, "A May Morning", exhibited in 1890, met with immediate success It was followed by "Fiametta's Song" (1894), "Richard of Gloucester and the Lady Anne" (1896), "King Lear's Daughters" (1898), and a screen for the American Church in Paris (1907) In 1901 he was commissioned to paint the "Coronation of Edward VII" (completed in 1904). Abbey's finest paintings are included in two decorative series The earliest of these, fifteen canvases representing the "Quest of the Holy Grail" (1891–1902), are in the Boston Public Library The last ten years of his life were devoted to mural paintings in the Pennsylvania State Capitol in Harrisburg

ABBEY THEATRE, repertory-theater company and the auditorium in which it performs, located in Dublin, Ireland Originally established to present native plays about native subjects, the company later expanded its repertory to include classical drama, including those of William Shakespeare, and contemporary works by dramatists of continental Europe

The Abbey Theatre is a product of the Irish cultural revival which began late in the 19th century The revival was initiated largely by the Irish poet and dramatist William Butler Yeats (q v), who urged Irish writers to draw their inspiration directly from Irish life and traditions rather than from British and European sources In 1899 Yeats helped to establish the Irish Literary Theatre which was reorganized in 1902 as the Irish National Theatre Society With financial assistance provided by the English theater manager Annie Elizabeth Fredericka Horniman (1860–1937), the Irish National Theatre Society established in 1904 the repertory company which became known as the Abbey Theatre, and which, since 1924, has received an annual government subsidy The new group introduced realistic and poetic elements into the Irish theater, it soon gained a popular following Notable Irish dramatists whose works were presented at various times included Yeats, John Millington Synge, Lady Augusta Gregory, George William Russell, Padraic Colum, St John Greer Ervine, and Sean O'Casey (qq v) Among the favorite plays of Abbey audiences were *Cathleen ni Houlihan* (1902) by Yeats, *Riders to the Sea* (1904) and *Playboy of the Western World* (1907) by Synge, and *Juno and the Paycock* (1924) and *The Plough and the Stars* (1926) by O'Casey The quality of their presentations declined after the death of Yeats in 1939 In 1951 the Abbey auditorium was severely damaged by fire, and the company moved to the Queen's Theatre On July 18, 1966, the completely new, 628-seat Abbey Theatre was opened on the site of its predecessor Below the Abbey foyer is the Peacock Theatre, used for experimental productions and for performances by pupils of the Abbey School of Acting

See IRISH LITERATURE E B

ABBOT, in certain religious orders, the head of a monastery or abbey Until the beginning of the 10th century the head of every monastery was called the abbot, but many of the orders founded after that time rejected the title The Carthusians, Dominicans, Carmelites, and Augustinians called the superior prepositor or prior, the Franciscans, custos or guardian The abbot was always bound to enforce the observance of the rules of his order, to administer the goods of the monastery, and to exact unconditional obedience from his monks In the 10th century many of the chief abbeys in Christendom were under lay abbots The members of the royal household received grants of abbeys as their maintenance, and the king kept the richest for himself In the Orthodox Church the superiors of monasteries are called hegumens or mandrites, and general abbots, archimandrites

ABBOTSFORD, estate and home of the Scottish writer Sir Walter Scott (q.v.) from 1824 until his death in 1832, in Roxburgh County, in southeastern Scotland, on the Tweed R., about 3 miles W. of Melrose. It occupies the former site of Cartleyhole, or Clarty Hole, a farm of 100 acres purchased by Scott in 1811. The main building is now a museum of mementos of Scott.

ABBOTT, name of two American sisters who were social workers and educators.

Edith Abbott (1876–1957), born in Grand Island, Nebr., and educated at the universities of Nebraska, Chicago, and London. She worked with various philanthropic organizations in Chicago, including Hull House (q.v.), the settlement house founded by the American social worker Jane Addams (q.v.). From 1924 to 1953 Miss Abbott served as dean of the school of social service administration of the University of Chicago. Among her books are *Women in Industry* (1910) and *The Tenements of Chicago* (1936).

Grace Abbott (1878–1939), born in Grand Island, Nebr., and educated at the universities of Nebraska and Chicago. Devoted to the cause of child welfare, she taught high school until 1907, worked with various philanthropic organizations in Chicago, and was director of the Child Labor Division of the Children's Bureau of the United States government from 1921 to 1934. In the last-named capacity she did effective work in promoting legislation to regulate child labor and in directing studies of all related problems, including delinquency and child neglect. From 1934 to 1939 she was professor of public welfare at the school of social service administration of the University of Chicago. Among her books are *The Immigrant and the Community* (1917) and *The Child and the State* (2 vol., 1938).

ABBOTT, George (1889–), American actor, playwright, producer, and director, born in Forestville, N.Y., and educated at the University of Rochester and Harvard University. He became an actor on the legitimate stage in 1913, was a motion-picture director from 1927 to 1930, and then a theatrical director. Abbott directed and produced the comedies *Boy Meets Girl* (1935) and *Kiss and Tell* (1943) and the musical plays *Pal Joey* (1940), *On the Town* (1944), *Call Me Madam* (1950), *Wonderful Town* (1953), and *A Funny Thing Happened on the Way to the Forum* (1962). He wrote and directed the musical plays *The Boys from Syracuse* (1938; adapted from *The Comedy of Errors* by the English playwright William Shakespeare (q.v.), which he produced, *Where's Charley?* (1948), and *New Girl in Town* (1957). He was coauthor and director of the comedy *Three Men on a Horse* (1934) and the musical plays *The Pajama Game* (1954), *Damn Yankees* (1955), and *Fiorello!* (1959, Pulitzer Prize, 1960).

ABBOTT, Sir John Joseph Caldwell (1821–93), Canadian lawyer, educator, and statesman who served briefly as prime minister (1891–92).

Born in Saint Andrews, Lower Canada (now Québec), on March 12, 1821, Abbott graduated from McGill University, Montréal, studied for the bar, and began his practice in 1847. He was elected to the Legislative Assembly of the united province of Canada in 1857 and served there and in the House of Commons until 1874, when he was involved with other Conservatives in an election scandal and failed to be reelected. In 1880, however, he was voted back into the House, to be appointed to the Senate seven years later. After service in the cabinet as minister without portfolio, he was chosen prime minister in 1891, but ill health soon forced him to resign. He was knighted in 1892. An expert in commercial law, Abbott was dean of the law faculty of McGill (1855–80). He died in Montréal on Oct. 30, 1893.

ABBREVIATION, letter or group of letters used in writing, printing, and speech to represent a word or phrase in shortened form. Abbreviations are used to save space and time and to avoid pronouncing long words and phrases. The most common are arbitrary signs or initial letters for the words themselves.

Shortened word forms have been in use since antiquity, and many current abbreviations have come from Latin. Most of the arts and sciences use symbols as abbreviations; they are universally understood. Although no specific rule governs the formation of abbreviations, certain kinds have become standard. The most common are (1) first and last letters, for example, Pa. for Pennsylvania; (2) key identifying letters, for example, mfg. for manufacturing; (3) syllables, for example, anon. for anonymous; (4) initials, as with titles or long names, for example, O.A.S. for Organization of American States.

A word formed from the initials or from the elements of a compound term is called an acronym, and is usually spelled without periods, such as NATO for North Atlantic Treaty Organization. An organization sometimes adopts a name the acronym of which indicates the nature of the organization. For example, the acronym WAVES comes from Women's Appointed Voluntary Emergency Service, although the official name of the organization is Women's Reserve of the United States Naval Reserve.

Accompanying this article is a selective list of commonly used abbreviations.

Å Angstrom
A A or AA Alcoholics Anonymous, antiaircraft
A A A Amateur Athletic Association, American Automobile Association
A A U Amateur Athletic Union
A B Bachelor of Arts
ab about
abbr abbreviation
A B C or ABC American Broadcasting Company
ab init *ab initio* (Lat , from the beginning)
Abp Archbishop
abr abridge, abridged, abridgment
A C Air Corps, Ambulance Corps, Army Corps
a c alternating current
a/c account, account current (bookkeeping)
Acad Academy
acad academic, academy
acct account
A C S American Chemical Society, American College of Surgeons
ACTH adrenocorticotropic hormone
ad advertisement, advertising
A D *anno Domini* (Medieval Lat , in the year of the Lord)
A D A American Dental Association, Americans for Democratic Action
adj adjective, adjourned, adjacent, adjoining
Adjt Adjutant
ad lib *ad libitum* (Lat , at one's pleasure)
Adm Admiral, Admiralty
adv adverb, adverbial, advertisement
A E C or AEC Atomic Energy Commission
A E F American Expeditionary Force
Af Africa, African
A F A M or A F &A M Ancient Free and Accepted Masons
AFB Air Force Base
A F L or A F of L American Federation of Labor
AFL-CIO American Federation of Labor and Congress of Industrial Organizations
A F M American Federation of Musicians
A F T R A American Federation of Television and Radio Artists
agric agriculture, agricultural
A I A American Institute of Architects
A I C American Institute of Chemists
AID Agency for International Development
Ala Alabama
A L A or ALA American Library Association
Alas Alaska
alt alternate, altitude
Alta Alberta (Canada)
Am America, American
AM or A M amplitude modulation
A M Master of Arts
A M or a m *ante meridiem* (Lat , before noon)
A M A American Medical Association
Amb Ambassador
A M E African Methodist Episcopal
AMG Allied Military Government
amp ampere
A M S Army Medical Service
amt amount
AMVETS American Veterans of World War II
anat anatomical, anatomy
anc ancient
anon anonymous
A N P A or ANPA American Newspaper Publishers Association
anthrop anthropological, anthropology
A/O or a/o account of
A O H Ancient Order of Hibernians
A P or AP Associated Press
A P O or APO Army Post Office
app appendix, appointed, approximate
approx approximate, approximately
Apr April
A P.S American Philatelic Society, American Philosophical Society, American Physical Society
apt apartment, pl , apts
Ar Arabic
ARC or A R C American Red Cross
arith arithmetic
Ariz Arizona
Ark Arkansas
A S Academy of Science, Anglo-Saxon
ASCAP American Society of Composers, Authors and Publishers
A S C E American Society of Civil Engineers
A S M E American Society of Mechanical Engineers
A S P C A American Society for Prevention of Cruelty to Animals
assn association
assoc associate, associated, association
A S S R Autonomous Soviet Socialist Republic
asst assistant
astr or astron astronomer, astronomical, astronomy
astrol astrology
Atl Atlantic
atm atmosphere, atmospheric
at m atomic mass
A T S American Temperance Society, Army Transport Service
atty attorney
Atty Gen Attorney General
at wt atomic weight
Aug August
AUS or A U S Army of the United States
Aust Austria, Austrian
Austral Australia, Australian
A V Authorized Version (of the Bible)
AVC or A V C American Veterans Committee
avdp avoirdupois
Ave or ave Avenue
aver or avg average
avoir avoirdupois
AWOL, A W O L , or a w o l absent without leave

b book, born
B A Bachelor of Arts, British Academy, Buenos Aires
bal balance
Balt Baltimore
Bart Baronet
B A S Bachelor of Agricultural Science, Bachelor of Applied Science
bat battalion
B B A Bachelor of Business Administration
B B C British Broadcasting Corporation
bbl barrel
B C Bachelor of Chemistry, Bachelor of Commerce, before Christ, British Columbia
B D Bachelor of Divinity
bd ft board foot
B E Bachelor of Education, Bachelor of Engineering, Bank of England, Board of Education
B Ed Bachelor of Education
B E E Bachelor of Electrical Engineering
B E F British Expeditionary Force
Belg Belgian, Belgium
b f boldface
B F A Bachelor of Fine Arts
Bib Bible, Biblical
bibliog bibliography
bicarb sodium bicarbonate
biog biographer, biographical
biol biological, biologist, biology
bk bank, block, book.
B L Bachelor of Laws, Bachelor of Letters
bldg building
BLS Bureau of Labor Statistics
B L S Bachelor of Library Science
Blvd or blvd boulevard
B M Bachelor of Medicine, Bachelor of Music, British Museum
BOAC British Overseas Airways
bor borough.
bot botanical, botanist, bottle
B P O E Benevolent and Protective Order of Elks.
Brig Brigade, Brigadier
Brig Gen Brigadier General
Brit Britain, British
Bro or bro brother, pl , Bros or bros
B S Bachelor of Science
Bt Baronet
B T U British thermal unit
Bu , bu , Bur , or bur bureau
bu bushel
B V M Blessed Virgin Mary
B W I British West Indies
Bz benzene

C Celsius, centigrade
ca *circa* (Lat , about)
CAB or C A B Civil Aeronautics Board
Cal California, large calorie
cal calendar, caliber, small calorie (or calories)
Calif California
Can Canada, Canadian
CAP Civil Air Patrol
cap capital, capitalize
caps capital letters
Capt Captain
Card Cardinal
CARE Cooperative for American Remittances to Europe
Cath Catholic
CATV Cable Antenna Television
C B C Canadian Broadcasting Corporation
C B S or CBS Columbia Broadcasting System
c c or cc cubic centimeter
C C C or CCC Civilian Conservation Corps, Commodity Credit Corporation
C D Civil Defense
C E Civil Engineer, Common Era
cent centigrade, centimeter, central, century
CENTO Central Treaty Organization
cf compare
c f m cubic feet per minute
c f s cubic feet per second
C G Coast Guard, Commanding General
chap chaplain, chapter
chem chemist, chemistry
CIA Central Intelligence Agency
C I O Congress of Industrial Organizations
C J or CJ Chief Justice
CLU Civil Liberties Union
cm or cm centimeter
C O Commanding Officer, conscientious objector
Co company, county
c/o care of
C O D cash on delivery
C of S Chief of Staff
Col Colonel, Colorado, Columbia
col college, colony, column
Coll College
coll college, collective, collection
colloq colloquial, colloquialism
Colo Colorado
Com Commander, Commission; Commissioner, Commodore
com commerce, committee, common
Comdr Commander, Commodore
Comdt Commandant
Comr Commissioner
Cong Congregational, Congress, Congressional
Conn Connecticut
conf conference
Cont continental
cont containing, contents, continent, continue
contd continued
CORE Congress Of Racial Equality
Corp or corp Corporal, corporation
C P A or CPA Certified Public Accountant
C S Christian Science, Christian Scientist
C.S.A Confederate States Army, Confederate States of America
CST or C S T Central Standard Time
ct cent
ctr center

cu ft	cubic foot, cubic feet
cu in	cubic inch, cubic inches
C V	Common Version (of the Bible)
C Z	(Panama) Canal Zone
Czech	Czechoslovakian

d	date, daughter, day, days, density (physics), dead, died
D A	District Attorney
D A B or DAB	Dictionary of American Biography (U S)
D A R	Daughters of the American Revolution
dbl	double
D C	District of Columbia
d c	direct current
D D	Doctor of Divinity
D D S	Doctor of Dental Surgery
DDT	dichlorodiphenyl-trichloroethane
Dec	December
dec	deceased, decimeter, declension, decrease
def	deferred, defined, definition
deg	degree, degrees
Del	Delaware
Dem	Democrat, Democratic
dep	departure, depot, deputy
dept	department
DEW	Distant Early Warning
D F C	Distinguished Flying Cross (Britain)
D F M	Distinguished Flying Medal (Britain)
diam	diameter
dict	dictation, dictator, dictionary
dim	dimension, diminuendo
dir	director
Dist Atty	District Attorney
D Lit or D Litt	Doctor of Literature (or of Letters)
D L O	Dead Letter Office
D L S	Doctor of Library Science
D Mus	Doctor of Music
DNA	deoxyribonucleic acid
D N B or DNB	Dictionary of National Biography (Britain)
do	ditto
D O	Doctor of Osteopathy
DOD	Department of Defense
doz	dozen
D P	displaced person
Dr	doctor, Drive (street address)
D S	Doctor of Science
D S C	Distinguished Service Cross
DST or D S T	Daylight Saving Time
d t or d t 's	delirium tremens
D V	*Deo volente* (Lat , God willing), Douay Version (of Bible)
dwt	denarius weight, *i e*, pennyweight
DX	distance (radio)

E, E , E or e	east, eastern
E	Earl, Earth, English
e	erg
ea	each
econ.	economist, economy
Ecua	Ecuador
ed	edited, edition, editor
Ed D	Doctor of Education
e g	*exempli gratia* (Lat , for example)
elec	electric, electricity
Eliz	Elizabeth, Elizabethan
e m f or E M.F	electromotive force
Emp	Emperor, Empire, Empress
encl	enclosed, enclosure
ency	encyclopedia
Eng	England, English
Epis or Episc	Episcopal
eq	equal, equation
ESP	extrasensory perception
E R.V	English Revised Version (of the Bible)
esp	especially
Esq	Esquire
EST or E S T	Eastern Standard Time
et al	*et alii* (Lat , and the others)
etc	*et cetera* (Lat , and the other things)
ETV	educational television
Eur	Europe; European
Euratom	European Atomic Energy Community
ex lib	*ex libris* (Lat , from the books)

F	Fahrenheit
F A A or FAA	Federal Aviation Agency
FAO	Food and Agriculture Organization
FBI or F B I	Federal Bureau of Investigation
FCA	Farm Credit Administration
F C C or FCC	Federal Communications Commission
FDA	Food and Drug Administration
F D I C or FDIC	Federal Deposit Insurance Corporation
F D R	Franklin Delano Roosevelt
Feb	February
Fed	Federal
fem	feminine
ff	folios, following, fortissimo
F H A	Federal Housing Administration
FICA	Federal Insurance Contributions Act
fig	figure, figures
Fin	Finland, Finnish
fin	financial
Fla	Florida
Flem	Flemish
fl oz	fluid ounce
FM or F M	frequency modulation
F O B	free on board
FPC	Federal Power Commission
FPO	Fleet Post Office
Fr	French
Fri	Friday
ft	feet, foot, fort
F T C or FTC	Federal Trade Commission
ft -lb	foot-pound
FYI	for your information

g	gram, grams, gravity
Ga	Georgia
Gael	Gaelic
gal	gallon
G A R	Grand Army of the Republic
G B	Great Britain
Gen	General, Genesis, Geneva
geog	geographer, geographical, geography
geol	geologic, geologist, geology
geom	geometric, geometry
Ger	German, Germany
GI or G I	general issue or government issue, referring to anything issued by the U S Army, thus, colloquially, an enlisted man or woman or anything standard or according to regulations
Gk	Greek
gloss	glossary
GNP	Gross National Product
G O P	Grand Old Party (a rhetorical name for the U S Republican Party).
Gov or gov	governor
Govt or govt	government
G P O or GPO	general post office, government printing office
Gr	Grecian, Greece; Greek
Gr Br or Gr Brit	Great Britain
gr wt	gross weight

hdqrs	headquarters
HEW	Health, Education, and Welfare
HF	high frequency
H I	Hawaiian Islands
H M S	His (or Her) Majesty's Service (or Ship)
Hon	Honorable.
hort	horticultural; horticulture
HP, H P , hp, or h p	horsepower
HQ, H Q., hq , or h q	headquarters
H R	House of Representatives
hr	hour, hours
H R H	His (or Her) Royal Highness
ht.	height
HUAC	House Un-American Activities Committee
HUD	Department of Housing and Urban Development
Hung	Hungarian, Hungary
H V	high voltage
H W M	high-water mark
hwy	highway

I.	Island, Islands, Isle, Isles
Ia	Iowa
IAEA	International Atomic Energy Agency
ibid or ib	*ibidem* (Lat , in the same place)
ICAO	International Civil Aviation Organization
ICBM	Intercontinental Ballistic Missile
I C C	Interstate Commerce Commission
Ida	Idaho
i e	*id est* (Lat , that is)
IFC	International Finance Corporation
IGY or I G Y	International Geophysical Year
Ill	Illinois
ill	illustrated, illustration
ILO or I L O	International Labor Organization
IMCO	Inter-Governmental Maritime Consultative Organization
in	inch, inches
inc	included, including, inclusive, incorporated
incog	incognito
Ind	India, Indian, Indiana, Indies
ind	independent, index, indicative
inf	infinitive, information
Inf	infantry
Inst	institute, institution
inst	installment, instant
IOU	I owe you
IPA or I P A	International Phonetic Alphabet
I Q or IQ	intelligence quotient
i q	*idem quod* (Lat , the same as)
IRBM	Intermediate Range Ballistic Missile
Ire	Ireland
IRO	International Refugee Organization
ital	italic (print)
I T U or ITU	International Typographical Union, International Telecommunication Union
I W W	Industrial Workers of the World

Jan	January
Jas	James
J C S or JCS	Joint Chiefs of Staff
J D	Doctor of Law
jg or j g	junior grade (U S Navy)
J P	Justice of the Peace
Jr	Junior

K	Kelvin
Kan or Kans	Kansas
kg	kilogram, kilograms
kilo	kilogram, kilometer, pl , kilos
K K K	Ku Klux Klan
km or km	kilometer.
K of C	Knights of Columbus
K of P	Knights of Pythias
K P	kitchen police
kw	kilowatt
K W H , kw-h, kw hr , or kw-hr	kilowatt hour
Ky	Kentucky

L A	Los Angeles
La	Louisiana
Lab	Labrador
lab	laboratory
lang	language
Lat	Latin
lat	latitude
lb	pound, pl , lbs or lb
l c	left center, lower case (print)
L C.D or l c d	lowest common denominator.
L C M or l c m	lowest (or least) common multiple
Legis	Legislature
lex.	lexicon
L I	Long Island
Lib	Liberal
lib	*liber* (Lat , book), librarian, library
Lieut	Lieutenant
lin.	linear
liq	liquid, liquor
lit	literal, literature
Lith	Lithuanian
litho	lithograph, lithography

LL B Bachelor of Laws
LL D Doctor of Laws
loc cit *loco citato* (Lat , in the place cited)
log or logs logarithm
long longitude
Lt Lieutenant
Ltd or ltd limited
Luth Lutheran
L W M low-water mark

M thousand (Roman numeral)
M Monday, Monsieur (pl MM)
m male, married, masculine, meter, mile, minute, month
M A Master of Arts
mag magazine
Maj Major
Man or Manit Manitoba
Mar March, Marquis
mas or masc masculine
Mass Massachusetts
math mathematics
max maximum
M B A Master of Business Administration
M B S or MBS Mutual Broadcasting System
M C Master of Ceremonies, Member of Congress
M D Doctor of Medicine
Md Maryland
M D S Master of Dental Surgery
mdse merchandise
Me Maine
ME, ME , or M E Middle English
M E Methodist Episcopal, Mining (or Mechanical) Engineer
mech mechanical, mechanics
med medical, medicine
Medit Mediterranean
memo memorandum
mer meridian
Messrs Messieurs
meteorol meteorology
Meth Methodist
Mex Mexican, Mexico
M F A Master of Fine Arts
mfd manufactured
mfg manufacturing
mfr manufacturer
MG Military Government
mg or mg milligram
Mgr Manager, Monsignor
M I Military Intelligence
mi mile
Mich Michigan
mil military, militia
mim mimeograph
min minimum, mining, minute, minutes
Minn Minnesota
misc miscellaneous
Miss Mississippi
Mlle Mademoiselle
Mlles Mesdemoiselles
mm or mm millimeter, millimeters
Mme Madame
Mmes Mesdames
Mo Missouri
M O Medical Officer
M O or m o money order
mo month, pl , mos
mol molecular, molecule
Mon Monday
Mont Montana
MP or M P Military Police
M P Member of Parliament
mph or m p h miles per hour
Mr or Mr Mister (title)
Mrs Mistress (title, pl , Mmes)
Ms , MS , or ms manuscript; pl , Mss , MSS , mss
M S Master of Science
MST or M S T Mountain Standard Time
Mt Mount, pl , Mts

N, N , N, or n north, northern
N Navy, November
n noun
N A North America
NAACP National Association for the Advancement of Colored People
N A B National Association of Broadcasters
N A D National Academy of Design
NAM or N A M National Association of Manufacturers
NASA National Aeronautics and Space Administration
nat or natl national
NATO North Atlantic Treaty Organization
naut nautical
nav naval, navigation
N B *nota bene* (Lat , mark well), New Brunswick
NBA or N B A National Basketball Association, National Boxing Association
N B C or NBC National Broadcasting Company
N C North Carolina
N C O noncommissioned officer
N D or N Dak North Dakota
N E New England
NE, N E , NE, or n e northeast, northeastern
N E A National Educational Association
Neb or Nebr Nebraska
N E I Netherlands East Indies
Neth Netherlands
Nev Nevada
Newf Newfoundland
N F Newfoundland
N F L National Football League
Nfld Newfoundland
N G National Guard, no good
N H New Hampshire
NIH National Institutes of Health
N J New Jersey
N L F National Liberation Front
NLRB or N L R B National Labor Relations Board
N Mex or N M New Mexico
No north, northern, number
noncom noncommissioned officer
Nov November
N P Notary Public
N S North Sea, Nova Scotia
NSA National Shipping Authority, National Student Association
NSF National Science Foundation
N T New Testament
N W T Northwest Territories
NW, N W , NW or n w northwest
N.Y New York
N Y C New York City

O Ohio
O A S or OAS Organization of American States
obj object, objective
obs observation, obsolete
O C D M or OCDM Office of Civil and Defense Mobilization
OCS Officer Candidates School
Oct October
O D Officer of the day, ordinary seaman, Doctor of Optometry
OE, OE , or O E Old English
O E D or OED Oxford English Dictionary
O E E C or OEEC Organization for European Economic Cooperation
OEO Office of Economic Opportunity
O K or OK correct, approved
Okla Oklahoma
Ont Ontario
op cit *opere citato* (Lat , in the work cited)
Ore or Oreg Oregon
orig origin, original.
O S Old Saxon, Old School, Old Series, Old Style
O S S or oss Office of Strategic Services
O T Old Testament
O T C Officers' Training Camp (or Corps)
Oxon *Oxonia* (Lat , Oxford)
oz ounce, ounces

P or p page
PA public address system
Pa Pennsylvania
Pacif Pacific
Pan Panama
P and L profit and loss
par paragraph, parallel, parish
Para Paraguay
paren parenthesis, pl , parens
parl parliamentary
pat patent
path or pathol pathology
payt payment
P C Panama Canal, Past Commander
p c per cent, postcard
P D Police Department, Postal District
pd paid
P E Protestant Episcopal
P E I Prince Edward Island
P E N Poets, Playwrights, Editors, Essayists and Novelists (International Association of)
pen peninsula, penitentiary
Penn or Penna Pennsylvania
per an *per annum* (Lat , annually)
Pers Persia, Persian
Pfc Private first class
pfd preferred
PGA Professional Golfers' Association
Ph D Doctor of Philosophy
phil or philos philosopher, philosophy
Phila Philadephia
PHS Public Health Service
phys physical, physician, physics
P I Philippine Islands
pk or pkg package
pl place, plural
P M Past Master, Paymaster, Police Magistrate
P M or p m *post meridiem* (Lat , after noon)
P O petty officer, postal order, post office
Pol Poland, Polish
pol or polit political, politics
pop population
Port Portugal, Portuguese
poss possession, possessive
POW or P O W prisoner of war, pl , POWs, P O W 's
pp pages
pp pianissimo
p p parcel post, past participle, postpaid
P Q Province of Québec
P R public relations, Puerto Rico, proportional representation
pr pair
pref preface, preferred, prefix
Pres President
Presb Presbyterian
Prof or prof professor
pron pronoun, pronunciation
Prot Protestant
pro tem *pro tempore* (Lat , for the time)
Prov Provençal, Proverbs, province
P S *post scriptum* (Lat , postscript), Public School
pseud pseudonym
PST or P S T Pacific Standard Time
psych or psychol psychological, psychology
pt part, pint, point, pl , pts
P T A or PTA Parent-Teacher Association
PT boat patrol torpedo boat
P T O or p t o please turn over
pub public, published, publisher, publication
Pvt Private
PW prisoner of war

q e *quod est* (Lat , which is)
Q E D *quod erat demonstrandum* (Lat , which was to be proved)
Q M C or QMC Quartermaster Corps
qt quantity, quart, quarts
qts quarts
Que Québec
ques question
quot quotation
q v *quod vide* (Lat , which see), symbol referring a reader to the article preceding the symbol, pl , qq v

R A Rear Admiral, Regular Army, Royal Academy

R A F or RAF	Royal Air Force (Britain)
R and D	Research and Development
R and R	Rest and Recuperation
R B I	run batted in, runs batted in
R C	Red Cross, Reserve Corps, Roman Catholic
R C A F	Royal Canadian Air Force
rcd	received
R C M P	Royal Canadian Mounted Police
R E	real estate, Reformed Episcopal, Right Excellent
R E A or REA	Rural Electrification Administration
rec	receipt, recipe, record
recd	received
ref	referee, reference, referred, reformed
Ref Ch	Reformed Church
Rep	Representative, Republic, Republican
req	request, required
ret or RET	retired
Rev	Revelation, Reverend
rev	revenue, reverse, review, revised
Rev Ver	Revised Version (Bible)
R F or r f	radio frequency
R F D	Rural Free Delivery
Rh factor	Rhesus factor
R I	Rhode Island
R I P	*requiescat in pace* (Lat , may he [or she] rest in peace)
rit	ritardando
rm	ream (paper), room
R N	Registered Nurse, Royal Navy
R O T C or ROTC	Reserve Officers' Training Corps
r p m	revolutions per minute
r p s	revolutions per second
R R	Railroad, Right Reverend
R S V	Revised Standard Version (of the Bible)
R S V P	*répondez s'il vous plait* (Fr , please reply)
Rt Hon	Right Honorable
Rt Rev	Right Reverend
Rum	Rumania, Rumanian
Russ.	Russia, Russian
R V	Revised Version (of the Bible)
Ry	Railway

S, S , s, or s	south, southern
S	Saint, Saturday, September
s	second, shilling, shillings, singular, son
S A	Salvation Army, South Africa, South America, South Australia
SAC or S A C	Strategic Air Command
SAM	surface-to-air missile.
Sask	Saskatchewan
Sat	Saturday, Saturn
Sax	Saxon, Saxony
S C	Signal Corps, South Carolina
Sc	Scotch, Scotland, Scottish
s c	small capitals (print)
sci	science, scientific
SCLC or S C L C	Southern Christian Leadership Conference
Script	Scripture
S D or S Dak	South Dakota
s d	*sine die* (Lat , without day, or without fixing a day)
SE, S E , SE, or s e	southeast
SEATO	Southeast Asia Treaty Organization
SEC	Securities and Exchange Commission
sec	second, secretary, section
Secy or secy	secretary
Sen	senate, senator
Sept	September
seq	sequel
Sgt	Sergeant
SHAEF	Supreme Headquarters, Allied Expeditionary Forces
SHAPE	Supreme Headquarters, Allied Powers, Europe
shpt	shipment.
S I.	Sandwich Islands, Staten Island
Sib	Siberia
Sic	Sicily
S J	Society of Jesus
Slav	Slavic, Slavonic
So	south, southern
Soc	Society
soc or sociol	sociological, sociology
SOP	Standard Operating Procedure
Sp	Spain, Spanish
SPAR	Women's Reserve of the U S Coast Guard, from the Coast Guard motto, *S(emper) Par(atus)*
S P C A	Society for the Prevention of Cruelty to Animals
S P C C	Society for the Prevention of Cruelty to Children
sp gr	specific gravity
sq	squadron, square
sq m or sq mi	square miles
Sr	Senior, Señor, Sir
S R O	standing room only
S S or S/S	steamship
SS	German elite guard under National Socialism
St	Saint, Strait, Street
st	stanza
Sun	Sunday
Supt	Superintendent
s v	*sub verbo* or *sub voce* (Lat , under the word)
Sw	Sweden, Swedish
S W	South Wales
SW, S W , sw, or s w	southwest, southwestern
Swit , Switz , or Swtz	Switzerland
syn	synonym, synonymous
synop	synopsis
Syr	Syria, Syrian

TB, T B , or t b	tuberculosis
tbs or tbsp	tablespoon, tablespoons
tech	technical
temp	temperature, temporary
Tenn	Tennessee
ter	territory
Tex	Texan, Texas
T H I	Temperature-Humidity Index
Thurs	Thursday
tinct	tincture
TKO, T K O , or t k o	technical knockout
TNT or T N T	trinitrotoluene, trinitrotoluol
tr	transitive, transpose
trans	translate, translated
transp	transportation
tsp	teaspoon, teaspoons
treas	treasurer
trig	trigonometry
Tu or Tues	Tuesday
Turk	Turkey, Turkish
TV	television
T V A or TVA	Tennessee Valley Authority
TWA or T.W A	Trans World Airlines
twp	township
typ or typog	typography

U A R	United Arab Republic
UAW or U A.W	United Auto Workers
u c	upper case (print)
UFO	unidentified flying object
UHF	ultrahigh frequency
U.K	United Kingdom
Unit	Unitarian
UN or U N	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations International Children's Emergency Fund
UNO or U N O	United Nations Organization
U P.I or UPI	United Press International
U P	United Presbyterian
UPU	Universal Postal Union
Uru.	Uruguay
U S	United States
U.S A	Union of South Africa, United States Army, United States of America.
U S C G	United States Coast Guard
USIA	United States Information Agency
U S M A	United States Military Academy
USMC or U S M C	United States Marine Corps
USN or U S N	United States Navy
U S N A	United States National Army, United States Naval Academy
U S N G	United States National Guard
U S S R	Union of Soviet Socialist Republics
U S S	United States Ship (or Steamship)
Ut	Utah

v	verb, versus, volt
Va	Virginia
V A	Vice-Admiral, Veterans Administration
V D	venereal disease
Ven	Venerable, Venice
Venez	Venezuela
ver	verse
vet	veteran, veterinarian
V F W	Veterans of Foreign Wars of the U S
VHF	very high frequency
V I	Virgin Islands
VIP or V I P	very important person (colloq)
Virg	Virgil, Virginia
viz	*videlicet* (Lat , namely)
vocab	vocabulary
vol , vols	volume, volumes
vox pop	*vox populi* (Lat , voice of the people)
V P	Vice-President
vs	versus
Vt	Vermont
v v	vice versa

W W , w or w	west, western
W	Wednesday
WAAF	Women's Auxiliary Air Force (Britain)
WAC	Women's Army Corps
WAF	Women in the Air Force (U S)
Wash	Washington
WAVES	Women Appointed for Volunteer Emergency Service
W C T U	Women's Christian Temperance Union
Wed	Wednesday
w f	wrong font (print)
WHO	World Health Organization
W I	West India, West Indies
Wis or Wisc	Wisconsin
wk	week
w l	wave length
WRENS or W R N S	Women's Royal Naval Service (Britain)
wt	weight
W Va	West Virginia
Wyo	Wyoming

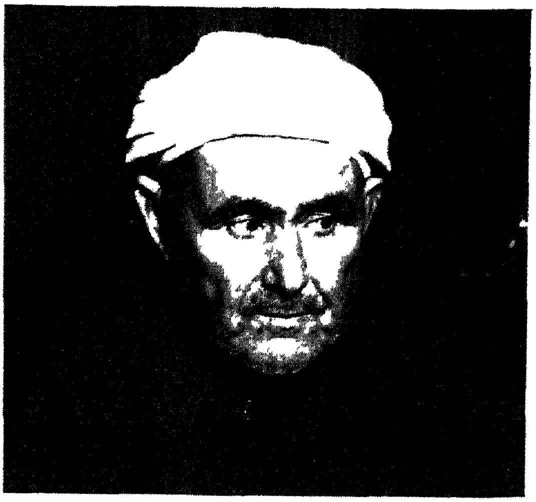
x	an unknown quantity
Xmas	Christmas

y	an unknown quantity
yd	yard
Y M C A	Young Men's Christian Association
Y.M Cath A	Young Men's Catholic Association
Y M.H A	Young Men's Hebrew Association
yr	year, your
Y T	Yukon Territory
Yuc	Yucatan
Y W C A	Young Women's Christian Association
Y W H A	Young Women's Hebrew Association

zool	zoological, zoology

A.B.C. POWERS, early-20th-century term for Argentina, Brazil, and Chile. Beginning in 1899 these nations, striving to maintain peace in South and Central America and to achieve common action and policy on problems concerning all Latin American countries, concluded a series of treaties which provided for arbitration of disputes and mutual assistance against aggression. The respective alliances were primarily directed against certain policies of the United States particularly those implicit in the Monroe Doctrine (q.v.). Shortly before the outbreak of World War I the alliances assumed the character of an entente cordiale. Treaties providing for such an entente were drafted and signed in 1915, but were never ratified. One of the most important collective accomplishments of the A.B.C. Powers was successful mediation in 1914 of a serious dispute between the U.S. and Mexico arising from the refusal of the U.S. to recognize General Victoriano Huerta (q.v.) as president of Mexico.

ABD-AL-AZIZ IV *or* **ABDUL-AZIZ** (1878–1943), Sultan of Morocco (1894–1908). Abd-al-Aziz succeeded his father Sultan Mulai Hassan on his death in 1894. He was friendly toward Europeans and took great interest in Western civilization. His foreign sympathies offended his subjects, and in 1902 a formidable rebellion broke out. The disorder enabled France to become predominant in Morocco. German activity in Morocco subsequently caused intense friction between France and Germany. At the suggestion of the sultan, a conference of European powers was held at Algeciras, Spain, in 1906. According to the decisions of the conference, France and Spain were commissioned to maintain order on the Moroccan coast. The sultan was deposed by his brother Abd-al-Hafiz (1875?–1937) in 1908. *See also* MOROCCO: *History*.



Abd-el-Krim, Arab leader of the Moroccan Riffian rebellion in the early 1920's, during a 1956 interview.

Wide World

ABD-EL-KRIM *or* **ABDEL KRIM** (1880?–1963), leader of the Riffians, an Arab tribe of Morocco. In 1921 he led his tribe against a Spanish military post in Er Rif, Morocco, capturing it and massacring 16,000 soldiers. By 1924 the Spanish were forced to retreat to their holdings along the coast of Morocco. Meanwhile, France laid claim to territory in southern Er Rif. The following year a French force under Marshal Henri Philippe Pétain (q.v.) and a Spanish army began operations against the Riffians. Hard fighting continued for a year, but finally the combined armies defeated the forces of Abd-el-Krim. He was exiled to the French island of Réunion from 1926 to 1947, when he was granted permission to live in southern France. He left the ship carrying him to France and, accepting an offer of protection from the king of Egypt, became a resident of that country. After 1948 he was a leader of the North African nationalist opposition to European rule. *See also* BERBER.

ABDERA, city of ancient Thrace, near the mouth of the Néstos R., almost opposite the island of Thásos. It was founded by colonists from the ancient Ionian city Clazomenae in the 7th century B.C. Several noted Greeks, including the philosophers Democritus and Protagoras (qq.v.), were born in Abdera. Ruins mark the site of the city.

ABD-ER-RAHMAN (d. 732), Arab soldier and Emir of Spain (731–32). He became governor of southern France in 721. In 732, when the growth of Frankish power menaced the Muslim position in Spain, he led an army across the Pyrenees mountains into the dominions of the Franks (q.v.). His army met the Franks, led by Charles Martel (q.v.), near Tours, France, later that year. In the ensuing battle, the Muslims were defeated and Abd-er-Rahman was killed.

ABD-ER-RAHMAN, name of several Umayyad rulers of Spain. The most important of these rulers were the following.

Abd-er-Rahman I, in Arabic 'ABD-AL-RAHMĀN IBN-MU'ĀWIYAH (731–88), Emir of Spain (756–88), grandson of Hisham, tenth Caliph of Damascus (d. 743). After the overthrow and death (750) of Marwan II, the last of the Umayyad caliphs of Damascus, Abd-er-Rahman took refuge in North Africa. In 755 he obtained the backing of Umayyad sympathizers in Spain and organized a rebellion against the Spanish emirate. The subsequent conflict, fought chiefly in the valley of the Guadalquivir R, ended in victory for the Umayyads in May, 756 Abd-er-Rahman was recognized as emir in the following July

Abd-er-Rahman III, in Arabic 'ABD-AL-RAHMĀN AL-NĀSIR (891–961), Emir of Spain (912–29) and Caliph of Spain (929–61). He succeeded to the emirate in 912 on the death of his grandfather Abd-er-Rahman I. Early in his reign he curbed the power of the nobility and created a highly centralized government He subsequently built a strong navy, wrested part of Morocco from the Fatimid dynasty, inflicted several defeats on the Christian kingdoms of León and Navarre, and assumed (929) the title of caliph A patron of learning, he helped to make Córdoba (q v.), his capital, the leading cultural center of Europe. *See also* CALIPH, SPAIN. *History*

ABD-ER-RAHMAN KHAN *or* **ABDURRAHMAN KHAN.** *See* AFGHANISTAN *History*

ABDICATION, relinquishment of office by a ruler or sovereign In modern times sovereigns have abdicated for many different reasons

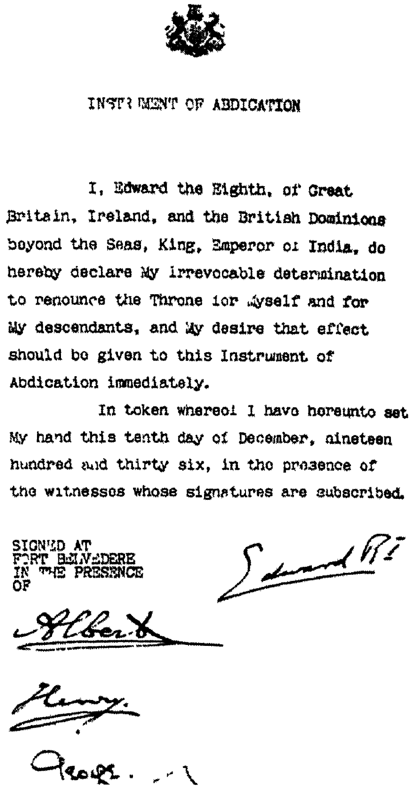
Queen Christina of Sweden relinquished her crown in 1654 because she was weary of the cares of office Ill health caused the abdication of the Holy Roman Emperor Charles V in 1558 and of Philip V of Spain in 1724 Louis Bonaparte, appointed (1806) king of Holland by the French emperor Napoleon I, abdicated in 1810 in protest because his brother treated Holland merely as a province of France Charles Emmanuel of Sardinia was compelled by the French government to abdicate in 1802, his successor, Victor Emmanuel, abdicated in 1821 in the face of a popular uprising against his regime Foreign force compelled the abdications of the Polish kings Augustus (1704), Stanislas I Leszczyński (1735), and Stanislas II Augustus (1795) and of Charles IV of Spain (1808). Napoleon I of France also was forced to abdicate by allied foreign powers, both in 1814 and, after his return to power, in 1815

Insurrections often have forced abdications, including those of Richard II of England (1399), Mary of Scotland (1567), Charles X of France (1830), Louis Philippe of France (1848), Ferdinand of Austria (1848), Louis of Bavaria (1848), Charles Albert of Sardinia (1849), Amadeus of Spain (1873), Prince Alexander of Bulgaria (1886), Milan of Serbia (1889), Manuel II of Portugal (1910), and Nicholas II of Russia (1917).

The defeat of the Central Powers in World War I resulted (1918) in a number of abdications, including those of William II of Germany, Charles I of Austria-Hungary, Louis III of Bavaria, Frederick Augustus III of Saxony, and William II of Wurttemberg Several abdications occurred also during the period between World War I and World War II King Constantine I of Greece was forced to abdicate twice by foreign and domestic political pressure in 1917, during World War I, and, after his recall, again in 1922 as a consequence of the Greek defeat in the Turkish War King Prajadhipok of Siam abdicated in 1935 because of bad health King Edward VIII (q.v) of Great Britain (later Duke of Windsor) abdicated in 1936 because the government opposed his marriage plans

In 1940, during World War II, Germany forced King Carol II of Rumania to abdicate The Iranian ruler Riza Shah Pahlavi was allegedly an Axis sympathizer, so when Great Britain and the Soviet Union occupied key areas of Iran in 1941 he abdicated in favor of his son King Victor Emmanuel of Italy abdicated in 1946 after the Italian electorate voted to establish a republic King Michael of Rumania abdicated in 1947 under Communist pressure

Queen Wilhelmina of the Netherlands abdicated in 1948 because of ill health. Left-wing political pressures forced King Leopold III of



INSTRUMENT OF ABDICATION

I, Edward the Eighth, of Great Britain, Ireland, and the British Dominions beyond the Seas, King, Emperor of India, do hereby declare My irrevocable determination to renounce the Throne for Myself and for My descendants, and My desire that effect should be given to this Instrument of Abdication immediately.

In token whereof I have hereunto set My hand this tenth day of December, nineteen hundred and thirty six, in the presence of the witnesses whose signatures are subscribed.

SIGNED AT
FORT BELVEDERE
IN THE PRESENCE
OF

Edward RI

Albert

Henry.

George.

The brief document formally announcing the abdication of King Edward VIII of Great Britain in 1936

Wide World

King Edward VIII (later the Duke of Windsor) of Great Britain at Enzesfield Castle in Austria shortly after his abdication in 1936 UPI

Belgium to abdicate in 1951 King Faruk I of Egypt had to abdicate in 1952 after a military coup d'état King Norodom Sihanouk abdicated the throne of Cambodia in 1955 in protest against internal opposition to his pro-Western policies

See separate articles on many of the individuals mentioned

ABDOMEN, lower of the two cavities into which the diaphragm divides the human body, or the region of the body containing this cavity It is subdivided into two parts, the abdomen proper, and the pelvis, or basin The abdomen proper contains organs of digestion, such as the liver, pancreas, stomach, small intestine, and large intestine, and the spleen and kidneys The pelvis contains the sigmoid flexure, the rectum, the urinary bladder, and the internal organs of the reproductive system The superficial aspect of the abdomen is divided, for descriptive purposes, into nine approximately equal areas From above downward, the three central areas are called the epigastric, umbilical, and hypogastric regions, respectively, these divisions are flanked by the right and left hypochondriac, lumbar, and inguinal regions In comparative anatomy, the abdomen is the posterior of the two or three parts into which the body of an arthropod is divided *See* ANATOMY, *see also* separate articles on various organs mentioned

ABDUCTION, originally, in ancient law, the unlawful taking away of a free person, or of a slave belonging to another Thus, the buying of a free person was punishable by the criminal law of Rome under the name of plagium, this term is still used in Scotland for the theft of children, male or female, under the age of puberty In the United States abduction is the taking and carrying away of a child, a ward, or a wife by fraud, persuasion, or open violence Anyone who takes away any female under the age of eighteen years from her father, mother, guardian, or other person having the legal charge of her person, without her consent, for the purpose of prostitution, is guilty of a felony A child under the age of fourteen years is incapable of giving her consent In England abduction technically means the taking away of a woman either against her own will, or (in the case of a woman under the age of twenty-one) against the will of her parents or guardians. *See* KIDNAPPING

ABDUL-AZIZ IV. *See* ABD-AL-AZIZ IV

ABDUL-AZIZ IBN-SAUD. *See under* IBN-SAUD

ABDUL-HAMID, name of two sultans of Turkey

Abdul-Hamid I (1725–89), son of Ahmed III (q.v) He succeeded to the throne on the death of his brother Mustafa III (1717–74) In 1774 Turkey was defeated by Russia in a war begun by Mustafa and was forced to relinquish the Crimea Another disastrous war (1787–92), against Russia and Austria, occupied the final years of his reign

Abdul-Hamid II (1842–1918), son of Abdul-Medjid I (1823–61) In 1876 he succeeded his brother Murad V (q v), who had been declared insane In reprisal against Turkish misrule in the Balkans, Russia declared war against Turkey in the second year of Abdul-Hamid's reign He suffered disastrous military reverses and, by the terms of the Treaty of Stefano in 1878, was deprived of most of his European territorial possessions Sanguinary massacres of Armenians occurred in Turkey during 1896 and 1897, but Abdul-Hamid refused to intervene, despite international protests Internal dissatisfaction with his despotic rule led to the development of the powerful revolutionary organization known as the Young Turks In 1909 Abdul-Hamid II was deposed and exiled *See* TURKEY *History*

ABDULLAH ET TAAISHA. *See* SUDAN, REPUBLIC OF THE· *History*

ABDULLAH IBN-HUSEIN (1882–1951), King of Jordan (1946–51), and son of King Husein ibn-Ali (1856–1931), of Hejaz, born in Mecca During World War I, with the support of the British, he led Arab revolts against the Turks in Arabia In 1921 he became the nominal ruler of the British mandate of Transjordan, with the title of emir He obtained qualified independence for the emirate in 1928 In May, 1946, after the British mandate had ended, he proclaimed himself king of Transjordan The State changed its name to Hashemite Kingdom of Jordan in 1949 Meanwhile, in 1945 he helped to establish the Arab League (q v), an association of Muslim states formed to prevent the establishment of a Jewish state in Palestine In May, 1948, immediately after the creation of the State of Israel (q v), King Abdullah led the Arab invasion of the new state. The Jordanian army, a British-trained organization known as the Arab Legion, was the only Arab army which gained any significant amount of Israeli territory in the ensueing war In April, 1949, Abdullah's government completed armistice negotiations with Israel, retaining control of Old Jerusalem, Bethlehem, Hebron, and other sectors of Palestine In the same year he proposed the formation of a Greater Syria, to consist of Jordan, Syria, and Iraq, his plan, however, was opposed by other members of the Arab League Abdullah further outraged the league when he formally annexed (1950) the Jordan-occupied portion of Palestine On July 20, 1951, as he entered the Al Aksa mosque in Jerulsalem, Abdullah was assassinated by one of the Palestinian Arabs who opposed that annexation *See also* JORDAN *History*

ABÉCHER, *or* ABÉCHÉ, town of Chad, administrative center of Wadai (Ouaddai) Prefecture, about 400 miles N E of Fort-Lamy A major trade center, with road traffic eastward to Sudan and caravans northward to Libya, the town trades in livestock, dried fish, hides and skins, gum arabic, dates, salt, and indigo, and is noted for the weaving of textiles Abécher is in a sheep-raising and farming area and has a meat-packing plant It is the site of a Franco-Arab college The town was the capital of an independent sultanate in the 16th century and of the Wadai kingdom in the 19th century, and was a notorious slave-trading center for about 300 years The name of the town is sometimes spelled Abeshr Pop (1964 est) 24,269

À BECKET, Thomas. *See* BECKET, THOMAS A, SAINT

ABEL, in the Old Testament book of Genesis, the second son of Adam and Eve, and the brother of Cain (qq v) Abel was a shepherd, and his older brother Cain cultivated the land. Jealous that Abel's sacrifice of the firstlings (first offspring) of his flock was accepted by God, while his own offering of first fruits (initial harvest) was not, Cain slew Abel (Gen 4 1–8) This fratricide is the main theme of the story Also underlying the story is the conception of the seminomadic life as intrinsically nobler and more pleasing to God than the life of the farmer Even in later Hebrew thought Abel remained the type of the true worshiper, and his animal sacrifice was regarded as better than that of Cain (Heb 11 4) Abel was looked upon as the righteous man, the possessor of true faith, in contrast to Cain the wicked (Matt 23 35, Luke 11 51, 1 John 3 12).

ABEL, Sir Frederick Augustus (1827–1902), English chemist, born in London, and educated at the Royal College of Chemistry He devoted himself chiefly to the science of explosives. He was consulting chemist to the British War Department from 1854 to 1888

Abel introduced important improvements in the manufacture of guncotton and of blasting gelatin, and with the Scottish scientist Sir James Dewar (q v) invented cordite, a smokeless powder

ABEL, Niels Henrik (1802–29), Norwegian mathematician, born on Finnøya Island, Rogaland Co After study at the University of Christiania (now Oslo), he spent two years in Paris and Berlin and in 1828 was made instructor at the university and military school in Christiania He was the first to demonstrate conclusively the impossibility of solving by the elementary processes of algebra general equations of any degree higher than the fourth His chief contributions were made to the theory of functions, of which he was one of the founders An important class of transcendental functions are known as Abelian, from their discoverer (*see* FUNCTION) There are also Abelian equations, groups, and bodies The binomial theorem had been formulated by the English mathematician Sir Isaac Newton and the Swiss mathematician Leonhard Euler (qq v), but Abel gave it a more comprehensive generalization, including the cases of irrational and imaginary exponents (*see* BINOMIAL).

ABELARD, Peter (1079–1142), French scholastic philosopher and theologian, born near Nantes He left home to study at Loches with the French nominalist philosopher Roscellinus (d after 1120) and later in Paris with the French realist philosopher Guillaume de Champeaux (1070?–1121), *see* NOMINALISM, REALISM Critical of his masters, Abelard began to teach at Melun, at Corbeil, and in 1108 at Paris He soon gained fame throughout Europe as a teacher and original thinker In 1117 he became tutor to Héloise (1101?–64), the niece of Fulbert, a canon of Notre-Dame in Paris

Héloise and Abelard fell in love and she gave birth to a son whom they named Astrolabe At Abelard's insistence they were married secretly, since he had not yet received major orders Abelard persuaded Héloise to take holy vows at the Benedictine Abbey of Saint-Argenteuil Her family, at first enraged by the relationship between Héloise and Abelard and later somewhat placated by their marriage, finally decided that Abelard had abandoned Héloise at the abbey and had him emasculated Abelard, too, retired to a religious retreat at the Abbey of Saint-Denis-en-France, in Paris

Peter Abelard installing his wife Héloise as the abbess of the nunnery he founded at the Paraclete

Abelard's first published work, a treatise on the Trinity (1121), was condemned and ordered burned by a Roman Catholic council that met at Soissons in the same year Forced by criticism to leave St -Denis-en-France, Abelard founded a chapel and oratory, called the Paraclete, at Nogent-sur-Seine In 1125 he was elected abbot of the monastery at Saint-Gildas-de-Rhuis Heloise, who meanwhile had become prioress at Argenteuil, was called to the Paraclete as abbess of the nunnery established there At St -Gildas Abelard wrote his autobiographical *Historia Calamitatum* ("History of Misfortunes", 1132) At this time the famous exchange of letters with Héloise began, these letters have become classics of romantic correspondence In 1140 Saint Bernard of Clairvaux (q v), the most eminent French ecclesiastic of the period, provoked a Roman Catholic council in session at Sens, and Pope Innocent II (d 1142), into condemning Abelard for his skeptical, rationalistic writings and teaching On his way to Rome to appeal the condemnation, Abelard accepted the hospitality of Peter the Venerable (1092?–1156), abbot of the Abbey of Cluny, remaining there for many months Abelard died at a Clunist priory near Chalon-sur-Saône His body was taken to the Paraclete; when Héloise died in 1164 she was buried beside him, in 1817 both bodies were moved to a single tomb in the cemetery of Père Lachaise in Paris

The romantic appeal of the life of Abelard often overshadows the importance of his thought. In the emphasis he placed on dialectical discussion, Abelard followed the 9th-century philosopher and theologian Johannes Scotus Erigena (q v), and he foreshadowed the Italian Scholastic philosopher Saint Thomas Aquinas (q v) Abelard's important dialectical thesis that truth must be attained by carefully weighing all sides of any issue is presented in *Sic et Non* ("Thus and Otherwise", 1123?) He foreshadowed also the later theological reliance on the works of the Greek philosopher Aristotle (q v), rather than on those of Aristotle's teacher Plato (q v.)

Abelard reacted strongly against the theories of extreme realism, denying that universals have an independent existence outside the mind. According to Abelard, a universal is a functional word expressing the combined image of that word's common associations within the mind This position is not nominalism, because Abelard adds that the associations from which the image is formed and to which a universal name is given have a certain likeness, or common nature His theory is a definite step toward the moderate realism of Aquinas, but it lacks an explanation of how ideas are formed In the development of ethics, Abelard's great contribution was to maintain that an act is to be judged by the intention of the doer *See* PHILOSOPHY *Scholasticism*

In addition to the writings already mentioned, Abelard wrote many works in Latin on ethics, theology, and dialectics, as well as poetry and hymns

ABELE. *See* POPLAR

ABELMOSCHUS. *See* OKRA

ABENEZRA. *See* IBN EZRA

ABEOKUTA, city of Nigeria, in Western State, about 60 miles N of Lagos It is inhabited largely by the Yoruba (q v), a Sudanic-speaking, African Negro people Abeokuta is connected to Lagos by rail, and serves as the shipping center for an area producing cacao, palm kernels, and palm oil Handwoven fabrics are dyed in local factories Pop (1971) 226,361

ABERCROMBIE, Lascelles (1881–1938), British poet and critic, born in Ashton-upon-Mersey, England, and educated at Malvern College and Victoria University He became professor of English literature at Leeds University in 1922 and later taught at London and Oxford universities His published collections include *Interludes and Poems* (1908) and *Collected Poems* (1930) The latter comprises both poems and verse plays, notably *The Sale of Saint Thomas* Abercrombie's poetry is characterized by an austere strength and individuality and by a marked interest in metrical experimentation Although his work is highly reflective, he is often identified with the Georgians, a group of 20th-century British poets who carried on the romantic and lyrical tradition of the 19th century Abercrombie is well known also as a poetic theorist through his works *Principles of English Prosody* (1923), *The Theory of Poetry* (1924), and *Poetry, Its Music and Meaning* (1932)

ABERDARE, Great Britain, town in Glamorganshire, Wales, about 25 miles N W of Cardiff It lies within an anthracite and iron-ore region The chief industry is the manufacture of cables Pop (1972 est) 37,760

ABERDEEN, city in South Dakota, county seat of Brown Co , about 40 miles N of Redfield Popularly known as the Hub of the Two Dakotas, the city is served by four railroads and lies in one of the richest farm areas in the United States It is an agricultural trading center, with grain elevators, stockyards, and meat-packing plants, wholesale grocery houses, and plants processing dairy products. Other industries include the manufacture of farm tools and machinery The city is the site of Northern State College Aberdeen was settled in 1881 and incorporated as a city in 1882 Pop (1960) 23,073, (1970) 26,476

ABERDEEN, city and seaport of Washington, in Grays Harbor Co , at the mouth of the Chehalis R , about 47 miles W of Olympia Industries include fishing and fish canning and the manufacture of wood products, including lumber, plywood, shingles, furniture, pulp, and paper Aberdeen was founded in 1867 Pop (1960) 18,741, (1970) 18,489

ABERDEEN, residential town of Maryland, in Harford Co , about 30 miles N E of Baltimore Nearby to the S is Aberdeen Proving Ground, a United States military reservation covering 35,000 acres Pop (1960) 9679, (1970) 12,375

ABERDEEN, Great Britain, county in N E Scotland The coastline along the North Sea is about 65 mi long In the S W the terrain is mountainous, rising to 4269 ft above sea level at Ben Macdhui The chief rivers are the Dee, Deveron, Don, and Ythan Principal industries of the county are agriculture, granite quarrying, and the processing of foodstuffs The county fisheries are highly productive, and the Aberdeen Angus, a breed of cattle, is famous The Dee valley is a well-known resort area Balmoral Castle (q v) within the county is the royal residence in Scotland The county seat is Aberdeen (q v) Area, 1971 sq mi , pop (1971 est) 318,921

ABERDEEN, Great Britain, city and county town of Aberdeen Co , Scotland, at the mouth of the Dee and Don rivers, 95 miles N E of Edinburgh Part of the city lies within Kincardineshire It is an important seaport and third-largest city of Scotland Aberdeen is the principal commercial and industrial city in N Scotland Among the major industries are fishing, fish processing, granite quarrying and polishing, shipbuilding, and the manufacture of chemicals, paper, rope, textiles, and machinery The city is popularly known as the Granite City because of the many buildings constructed of local granite Points of interest include the Old Cathedral of Saint Machar, dating from the 14th century, and the University of Aberdeen, which was established in 1860 by the merger of King's College, founded in 1494, and Marischal College, founded in 1593. Aberdeen was chartered as a royal burgh in 1179 During the Scottish struggle against England, the city was occupied by the English for a period in the 13th century In 1891 the neighboring burghs of Old Aberdeen and Woodside were incorporated into the city Pop (1971 est) 181,785

ABERDEEN, Earl of. *See* GORDON (family)

ABERDEEN ANGUS. *See* CATTLE

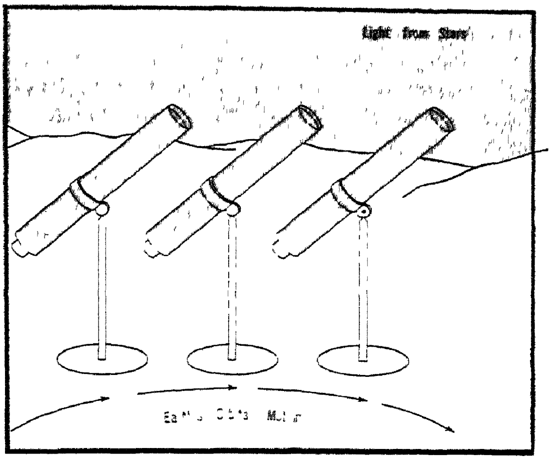
ABERDEEN, UNIVERSITY OF, coeducational institution of higher learning, located in Aberdeen, Scotland The university was incorporated in 1860, merging the College of Saint Mary, founded about 1494 and now called King's College, and Marischal College, established in 1593 Courses of instruction are offered in the arts, education, divinity, law, medicine, and science After a three-year "ordinary" or a four-year "honors" course of study the university awards either the master of arts or the bachelor of science degree, approximate equivalent of the degree of bachelor in America As graduate degrees the university awards the degrees of master (distinct from the master of arts) and doctor The university was the first institution in Great Britain to train students in medicine, a field in which it has achieved special fame The library contains more than 470,000 bound volumes Student enrollment in 1967–68 totaled 5149, and the faculty numbered about 760

ABERHART, William. *See* SOCIAL-CREDIT MOVEMENT

ABERNATHY, Ralph David (1926–), American clergyman and civil-rights leader, born in Linden, Ala Abernathy, ordained a Baptist minister in 1948, received a B S degree in mathematics from Alabama State College in 1950 and an M A degree in sociology from Atlanta University in 1951 Later that year he became pastor of the First Baptist Church, Montgomery, Ala Together with the American clergyman and civil-rights leader Martin Luther King, Jr (q v) he organized the Montgomery Improvement Association in 1955 and the Southern Christian Leadership Conference (S C L.C) in 1957, organizations devoted to achieving equality for Negroes in the United States In 1961 Abernathy became pastor of the West Hunter Street Baptist Church, Atlanta, Ga Frequently jailed with King for acts of civil disobedience, Abernathy was King's closest associate during the civil-rights campaigns of the late 1950's and early 1960's Upon the assassination of King in April, 1968, Abernathy succeeded him as president of the S C L C Abernathy led a march in support of a strike by Memphis, Tenn , sanitation workers on April 8, 1969, and was the leader of the Poor People's Campaign march and encampment in Washington, D C , in May, 1969 He was reelected to the presidency in 1969 and 1973

ABERRATION. *See* OPTICS *Geometrical Optics Lenses.*

ABERRATION OF LIGHT, in astronomy, the alteration in the apparent position of a star, arising from motion of the observer transverse to the direction of the beam of light observed Such motion is the resultant of such velocities as the speed of the diurnal rotation of the earth, its orbital speed in revolving around the sun, and the speed of the solar system through space Although the resultant velocity of the observer is small compared with the velocity of light, it is enough to cause an apparent displacement of the rays of light from a celestial object, just as a drop of rain, falling vertically, leaves a diagonal trace on the window of a moving car This displacement reaches a maximum of 20 47 sec of an arc, called the constant of aberration The discovery of the aberration of light, by the British astronomer James Bradley (q v) in 1727, was one of the most important discoveries in physical science, the discovery initiated a series of investigations that led to the formulation of the theory of relativity (q v)



The effect of aberration of light on telescopic observation Telescope receiving light from stars is moved by the earth's motion before the rays reach the end of the telescope tube

ABERYSTWYTH, Great Britain, seaport and municipal borough of Cardiganshire, Wales, at the mouth of the Ystwyth R , on Cardigan Bay about 240 miles N W of London It is the site of the University College of Wales (founded in 1872) and the National Library of Wales (opened in 1911) Pop (1971) 10,688

ABIATHAR (fl 10th cent B C), in the Old Testament, the son of Ahimelech, a priest He fled during a slaughter of priests in Nob under King Saul (q v) and became religious consultant to David (q v), then an outlaw in Judea (1 Sam 22 19–23) Later, as a priest, Abiathar supported King David during the rebellion of David's son, Absalom (2 Sam 15.24–37) Subsequently, Abiathar joined the unsuccessful rebellion of Adonijah, another son of David, against King Solomon (q v) After the revolt was crushed, Solomon stripped Abiathar of priestly office and banished him from Jerusalem (1 Kings 1 5–7, 2 26–27)

ABIDJAN, capital and seaport of the Republic of the Ivory Coast, in the Southern Department, about 260 miles w of Accra, Ghana It is centered on a peninsula in Ebrié Lagoon, goods are shipped to the Gulf of Guinea via the 1 7-mile-long Vridi Canal Abidjan is the ocean terminus of the Abidjan-Niger Railroad, serving the interior and Upper Volta. The city ships cocoa, cotton, palm products, coffee, rubber, timber, cola nuts, peanuts, pineapples, bananas, and fish Principal industries include food processing, brewing, shipbuilding, and the manufacture of metal products, soap, and cement Abidjan is the site of a center for higher education, which is to become part of the planned University of Abidjan, a technical school, and the Institut Français d'Afrique Noire, which contains a museum Banco National Park is nearby The city, which developed only after 1903 and the building of the railroad, is on the site of a neolithic settlement It is the administrative and educational center of the republic and succeeded Bingerville in 1935 as capital of the then French colony of the Ivory Coast Pop. (greater city, 1971 est) 650,000

ABIGAIL (fl 10th cent BC), in the Old Testament, wife of Nabal, a wealthy chief at Carmel who refused supplies of food to David (q.v), the future king of Israel and Judah, while the latter was an outlaw in the Judean wilderness David was on his way to punish Nabal when Abigail hastened to meet him with a present Her behavior so charmed David that, on the death of her husband, he married her (1 Sam 25 1–42)

ABILENE, city in Kansas, county seat of Dickinson Co, on the Smoky Hill R, about 160 miles w of Kansas City Industries include grain milling, the processing of dairy products, and the manufacture of steel and steel products Dwight David Eisenhower (q v), the thirty-fourth President of the United States, spent his youth in Abilene and is buried there in the chapel of the Eisenhower Center The center includes a memorial library and museum, and the former President's boyhood home Settled about 1856, Abilene was a shipping point for Texas cattle in the 1860's and 1870's It was incorporated as a city in 1869 Pop (1960) 6746, (1970) 6661

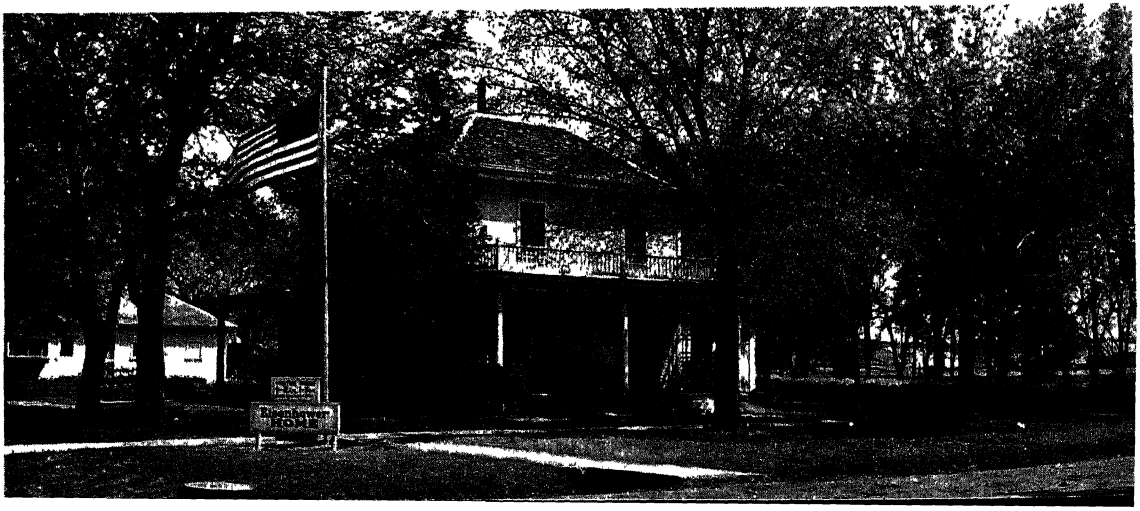
ABILENE, city in Texas, county seat of Taylor Co, about 150 miles sw of Fort Worth It lies in a region producing agricultural products, livestock, and petroleum and is a wholesale distribution point for cotton, wheat, dairy products, cottonseed products, livestock, poultry, petroleum products, and clothing Principal industries are oil refining, meat packing, and the manufacture of soap, watches, clothing, candy, cottonseed oil, and mattresses The city is the site of Hardin-Simmons University, Abilene Christian College, and McMurry College. Founded in 1881, Abilene was incorporated as a city in 1882 Pop (1960) 90,368, (1970) 89,259

ABINGTON, urban township in Pennsylvania, in Montgomery Co, 5 miles N of Philadelphia, of which it is a suburb. It is composed of numerous, chiefly residential villages and areas, among which are Crestmont, Noble, Roslyn, Rydal, Meadowbrook, and Hollywood The township manufactures electrical and rubber products, hosiery, paint, glass, instruments, and jewelry Pop. (1960) 55,831, (1970) 62,899

ABIOGENESIS. *See* SPONTANEOUS GENERATION.

ABITIBI, LAKE, shallow lake of E. Canada, straddling the Ontario-Québec border. The remnant of an ancient glacial lake, it is 97 km (60 mi) long and has an area of 932 sq km (360

The boyhood home of former President Dwight David Eisenhower in Abilene, Kans KIDC (Kansas) Photo



sq mi) Nearby coniferous forests are cut for pulpwood From the lake, the Abitibi R flows N to the Moose R near James Bay

ABKHAZ AUTONOMOUS SOVIET SOCIALIST REPUBLIC, *or* ABKHAZIA *or* ABKHASIA, administrative division of the U S S R , and subdivision of the Georgian S S R in N W Georgia, at the W end of the Caucasus Mts , and bordering on the Black Sea Once part of the Roman Empire, the region comprising Abkhaz later was successively part of the Byzantine Empire, the Kingdom of Georgia, and the Ottoman Empire In 1864 it was annexed by Russia. Abkhaz was proclaimed an Autonomous Soviet Socialist Republic in 1921

The coastal area is a fertile region with a subtropical climate, heavily forested mountains occupy most of the interior, which is largely uninhabited The coastal region is an important tobacco-producing area, and citrus fruits, wine grapes, and tea are also grown The area is a popular resort region The chief industries of the interior are livestock raising, coal mining, and lumbering

The capital, on the site of the ancient Greek town of Dioscurias, is Sukhumi The Abkhas, who make up about 30 percent of the population, belong to the Circassian linguistic stock, Georgians and Armenians make up the remainder Area, 3320 sq mi ; pop (1976 est) 501,000

ABNAKI, confederacy of Algonquian-speaking North American Indian tribes The most important Abnaki tribes were the Malecite, Norridgewock, Passamaquoddy, and Penobscot The original habitat of these tribes included Maine and sections of New Brunswick and Québec An early ally of the French, the confederacy was drawn into their struggle against the British The confederacy was destroyed in 1724–25, when the British imposed severe defeats on the Indians Remnants of the Penobscot and Passamaquoddy tribes live on reservations in Maine Most of the other survivors live in Saint Francis, Québec, and are called Abnaki *See* Algonquian; Passamaquoddy; Penobscot

ABNER, in the Old Testament, influential cousin of Saul (q v.), King of Israel, and captain of Saul's army (1 Sam 14 50, 52) during the long struggle with the Philistines (q v) After the king's death, he saved the crown for Saul's son Ish-bosheth. Later, resenting a charge made against him by Ish-bosheth, Abner went over to the side of David (q.v.), King of Judah and Israel, who was Ish-bosheth's rival Abner soon was murdered, however, by the Hebrew soldier Joab in revenge for Abner's earlier murder of Joab's brother, Asahel (2 Sam 2–3).

ABNORMAL PSYCHOLOGY. *See* Mental Disorders, Psychoanalysis, Psychotherapy

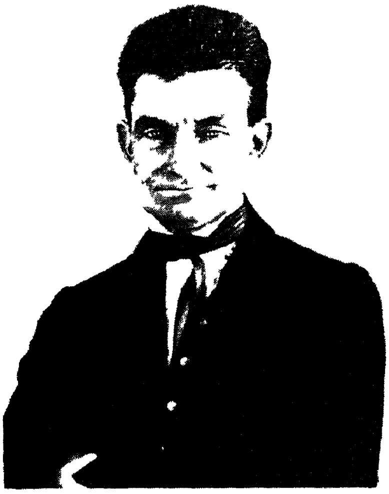
ÅBO. *See* Turku

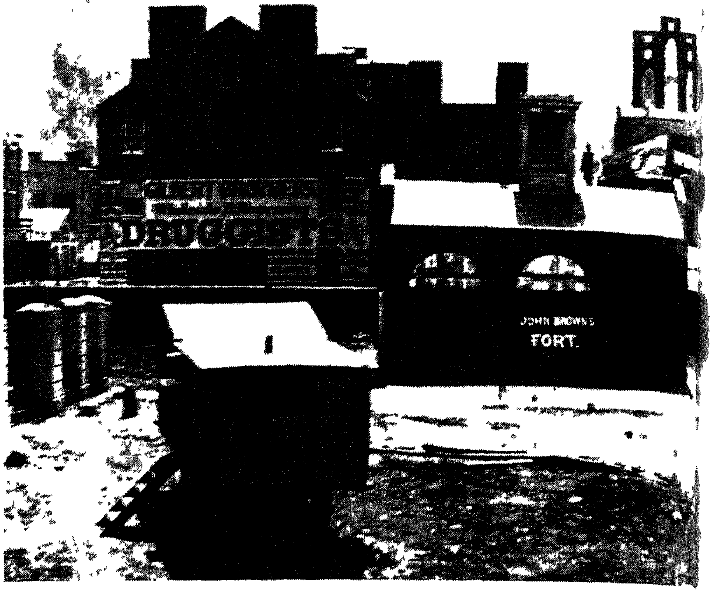
ABOLITIONISTS, in American history, term generally applied, from about 1835 until the close of the American Civil War in 1865, to extreme opponents of slavery (q v) Abolitionists differed from those of moderate antislavery feelings in that they called for an immediate end to slavery The most extreme abolitionists denied the validity of any laws which recognized slavery as an institution, thus, they refused to obey the Fugitive Slave Laws (q v) or accept the sections of the Constitution of the United States on which they were based In practice, abolitionists systematically violated the Fugitive Slave Laws by organizing and operating the Underground Railroad (q v), by which runaway slaves were concealed and transported to Canada The activities and propaganda of the abolitionists, although discredited in conservative Northern quarters and violently opposed in the South, made slavery a national issue

Most historians date the beginning of the abolitionist movement in 1831, when the American abolitionist William Lloyd Garrison (q v.) founded the *Liberator* in Boston, Mass This newspaper soon became the official organ of American abolitionism In 1833 the American Anti-Slavery Society (q v) was organized in Philadelphia, Pa , under Garrison's leadership, this society was the most militant of all the organizations in the fight against slavery In 1839 the society split into two main groups, the radicals and the so-called gradualists. The split resulted from a bitter disagreement concerning policy and tactics The radical leaders, who included, besides Garrison, Wendell Phillips, Lucretia Mott, and John Brown (qq v.), refused to join a party necessarily committed to gradual and legal emancipation of the slaves; these leaders retained control of the *Liberator* and the American Anti-Slavery Society. The gradualists, who included James Gillespie Birney (q v), Arthur Tappan (1786–1865) and his brother Lewis Tappan (1788–1873), and Theodore Dwight Weld (1803–95), believed that emancipation could be achieved legally, by means of pressures exerted through religious and political organizations In 1840 the Tappans founded the American and Foreign Anti-Slavery Society One year earlier, a group led by Birney founded the first antislavery political party, the Liberty Party (q v), in the United States Birney was the unsuccessful Presidential candidate (1840 and 1844) of the Liberty Party, the adherents of which helped to found the Free-Soil Party (q v) in 1848 and the Repub-

John Brown's "fort" (right) in the U S Arsenal at Harpers Ferry, Va (now W Va), where his militant antislavery forces were surrounded by local militia and U S Marines in 1859 Radical abolitionist John Brown (below), who was hanged for attempting to free the slaves by force

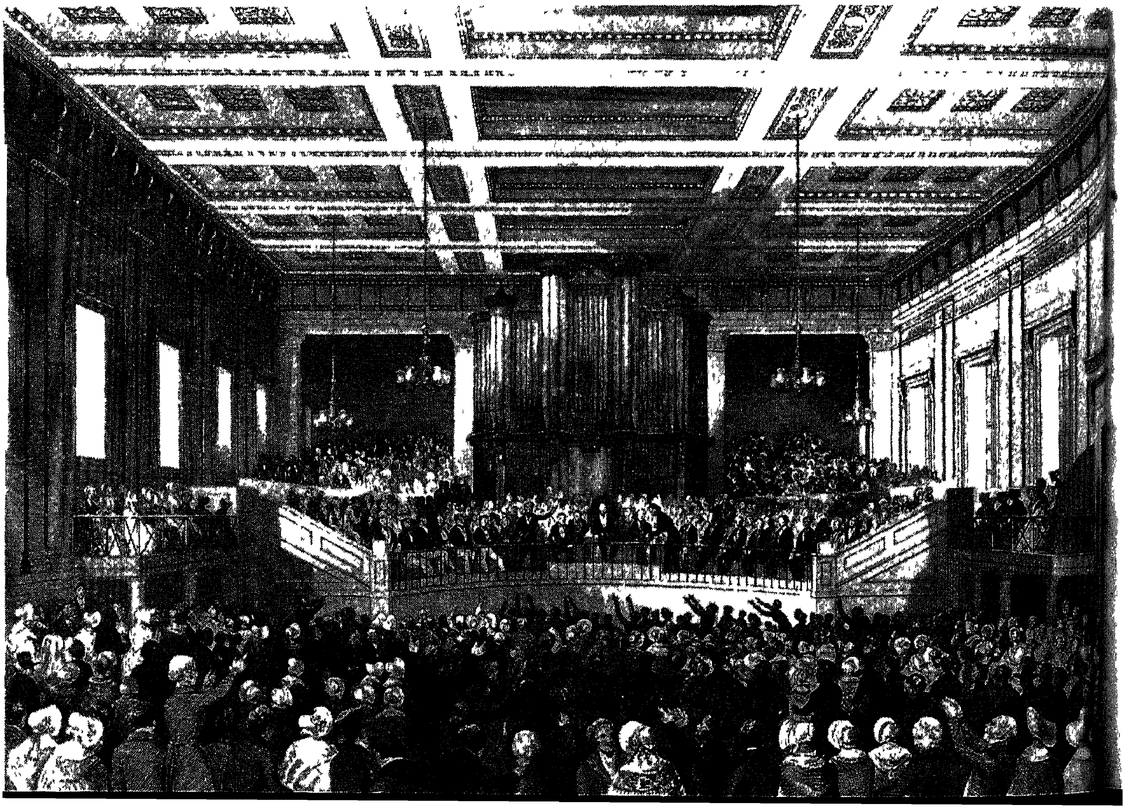
Library of Congress





An antislavery convention at London (below) in 1840 (from a 19th-century steel engraving) In the preceding year the first antislavery party in the U S, the Liberty Party, was founded

Granger Collection



lican Party (q v) in 1854 The bulk of the antislavery agitation was carried on by the American and Foreign Anti-Slavery Society and by numerous State organizations Most of the American antislavery societies were dissolved following the adoption in 1870 of the Fifteenth Amendment to the Constitution, which granted citizenship and equal rights to Negroes, *see* NEGROES IN THE UNITED STATES

In the 1600's Quaker abolitionist sentiment emerged in England, where in 1787 the Abolition Society was formed

ABORIGINES, earliest-known inhabitants of a country The term is applied generally to the original or native inhabitants of a country, as opposed to an intrusive conquering race, from another area, or to colonists and their descendants Most civilized nations have instituted measures for the welfare of the aborigines within their territories Such measures include those of the United States and Canada concerning Indians and Eskimos and those of Australia concerning its aboriginal groups

All aboriginal peoples have been affected by contact with contemporary civilization, in some cases the introduction of disease, warfare, alcohol, and drugs has demoralized and decimated peoples Some become almost wholly assimilated, as, for example, the Ainus (*see* AINU) of northern Japan. At present, among the Ainus, only the old and those in isolated communities retain their traditions, the young are adjusting to the Japanese culture The greatest degree of racial admixture has occurred among the native Polynesians (q v) of Hawaii The Indian population of the U S has extensively intermarried with whites, those Indians living on reservations retain some folkways In Central and South America and in the Caribbean region many tribes have become extinct, in most cases after Spanish or Portuguese conquest Among aborigines who have kept strong elements of original identity are the Eskimos (*see* ESKIMO), Maoris, Dayaks (qq v), and Australian aborigines (*see* AUSTRALIA· *The People· Aborigines*) Tribes in such comparatively inaccessible areas as the Amazon R basin of South America still live largely according to their primitive cultures

See also AMERICAN INDIANS and articles on the individual countries mentioned

ABORTION, termination of pregnancy before the fetus is capable of independent life When the expulsion from the womb occurs after the fetus becomes viable (capable of independent life), usually at the end of six months of pregnancy, it is technically a premature birth.

Abortion may be spontaneous or induced. Expelled fetuses weighing less than 16 oz or of less than twenty weeks' gestation usually are considered abortions It is estimated that some 25 percent of all human pregnancies terminate spontaneously in abortion, with three out of four abortions occurring during the first three months of pregnancy Some women apparently have a tendency to abort, and recurrent abortion decreases the probability of subsequent successful childbirth

The causes of spontaneous abortions, or miscarriages, are not clearly established Abnormal development of the embryo or placental tissue, or both, is found in about half of the cases, these abnormalities may be due to inherent faults in the germ cells or may be secondary to faulty implantation of the developing ovum or to other factors in the maternal environment Severe vitamin deficiencies have been shown to play a role in abortions in experimental animals Hormone deficiencies also have been found in women who are subject to recurrent abortions Spontaneous abortions may be caused also by such maternal abnormalities as acute infectious

An aborigine in northern Australia carving a canoe fashioned from a solid tree trunk The canoes are extremely sturdy, and are used to venture into the open sea in search of turtles and deep-sea fish Qantas diseases, systemic diseases such as nephritis and diabetes, severe trauma, and excessive physical activity Uterine malformations, including tumors, are responsible in some instances, and extreme anxiety and other psychic disturbances may be contributory factors in the premature expulsion of the fetus

The commonest symptom of threatened abortion is vaginal bleeding, with or without intermittent pain However, about one fourth of all pregnant women bleed at some time during early pregnancy, and up to 75 percent of these cases carry the fetus for the full term Treatment for threatened abortion usually consists of bed rest Almost continuous bed rest throughout pregnancy is required in some cases of repeated abortion, and vitamin and hormone therapy also may be given In addition, surgical correction of uterine abnormalities may be indicated in certain cases of repeated abortion

Spontaneous abortion may result in expulsion of all or part of the contents of the uterus or the embryo may die and be retained in the uterus for weeks or months in a so-called missed abortion. Most physicians advocate the surgical removal of any residual embryonic or placental tissue in order to avoid possible irritation or infection of the uterine lining

Induced Abortion. Induced abortion is the deliberate termination of pregnancy by removal of the fetus from the womb. The practice was widespread as a form of birth control in ancient civilizations and, although restricted or forbidden by most world religions, it was not an offense in secular law until the 19th century In 1803 the English Parliament prohibited induced abortion in order to protect women from a procedure that was at the time dangerous to their lives (protection of the fetus was not then a legislative concern). State legislatures in the United States gradually enacted similar statutes, generally stipulating a threat to the woman's life as the sole ("therapeutic") exception to the prohibition of abortion. Occasionally the exception was enlarged to include danger to her health as well. In 1869 the Catholic Church prohibited the practice with no exceptions; other major religions generally took less consistent positions.

Legislative action in the 20th century has been aimed at permitting the termination of unwanted pregnancies for medical, social, or private reasons Abortions at the woman's request were first allowed by the Soviet Union in 1920, followed by Japan and several East European nations after World War II. In the late 1960's liberalized abortion regulations became widespread The impetus for the change was threefold: (1) infanticide and the high maternal death rate associated with illegal abortions, (2) a rapidly expanding world population, (3) the growing women's rights movements By 1979, countries where abortions were prohibited or permitted only to save a woman's life contained 21 percent of the world's population Countries with moderately restrictive laws—abortions permitted to protect a woman's health, to end pregnancies resulting from rape or incest, to avoid genetic or congenital defects, or in response to social problems such as unmarried status or inadequate income—contained 39 percent of the world's population Abortions at the woman's request, usually with limits based on physical conditions such as duration of pregnancy, were allowed in countries with 37 percent of the world's population (The remaining 3 percent was unreported.)

In the U S, legislation followed the world trend Fourteen States adopted the moderately restrictive type of abortion law between 1967 and 1972 Four States (Alaska, Hawaii, New York, and Washington) legislated abortion on request with few restrictions. In 1973 the U S Supreme Court declared unconstitutional all State statutes but the least restrictive type Noting that induced early abortions had become safer than childbirth and holding that the word "person" in the Constitution "does not include the unborn", the Court defined, within each of the three stages of pregnancy, the reciprocal limits of State power and individual freedom

"(a) During the first trimester, the abortion decision and its effectuation must be left to the medical judgment of the pregnant woman's attending physician (b) After the first trimester, the State, in promoting its interest in the health of the mother, may, if it chooses, regulate the abortion procedure in ways that are reasonably related to maternal health (c) For the stage subsequent to viability, the State, in promoting its interest in the potentiality of human life may, if it chooses, regulate and even proscribe abortion, except where it is necessary, in appropriate medical judgment, for the preservation of the life or health of the mother".

Opponents of the 1973 Supreme Court ruling, arguing for the rights of the unborn, sought to restrict its application and began a campaign for a constitutional amendment to prohibit or severely restrict abortion.

In 1976 the Supreme Court struck down State laws requiring parental consent for a minor's abortion and the husband's consent for a married woman's abortion In 1977 the Court ruled that the Constitution does not require a State to pay for abortions of indigent women that are not medically necessary, nor does it compel a public hospital to provide abortion services.

Current abortion procedures have largely replaced surgery with simpler and safer methods. Pregnancies in the first trimester are usually terminated by vacuum suctioning and later pregnancies by saline or hormone infusion. These procedures greatly reduce the chances of perforation of the uterus, hemorrhage, and postabortal infection. C.T., C.C.M.

ABRABANEL *or* **ABARBANEL** *or* **ABRAVANEL,** name of a distinguished medieval Jewish family of southern Europe. Among the most important members were the following.

Isaac Abrabanel (1437–1508), statesman, philosopher, and theologian, born in Lisbon, Portugal. He was a favorite of Alfonso V (q.v.), king of Portugal, who made him his treasurer. After the king died in 1481, Abrabanel was accused of conspiracy and fled to Castile. For eight years (1484–92) he served as a minister under King Ferdinand V and Queen Isabella I. When the Jews were banished from Spain in 1492 he moved on, taking up residence in Naples. In 1503 he settled in Venice, where he was employed in diplomatic service. His theological writings include *Sources of Salvation* (1496), *Salvation of His Anointed* (1497), and *Proclaiming Salvation* (1498).

Judah León Abrabanel, better known as LEO HEBRAEUS (d. 1535), physician and writer, son of Isaac Abrabanel, born in Lisbon. He was medical attendant at the court of the Spanish military commander Hernández Gonzalo de Córdoba (q.v.). His most important work, *Dialogues of Love,* was published in Italian in 1535.

ABRAHAM *or* **ABRAM** (2nd millennium B.C.), traditional progenitor of the Hebrew people, according to the Old Testament (*see* HEBREWS) and regarded by Muslims, who call him Ibraham, as an ancestor (*see* ISHMAEL). Originally called Abram, he was the son of Terah (Gen. 11:26), a descendant of Shem (q.v.), and was born in the city of Ur (q.v.) of the Chaldees, where he married his half sister Sarai, or Sarah (Gen. 11:29). They left Ur with his nephew Lot (q.v.) and Lot's family under a divine inspiration (Gen. 15:7) and went to Haran (Gen. 11:31). Receiving a promise that God would make him a "great nation", Abram moved on to Canaan (Gen. 12:1–2), where he lived as a nomad. Famine led him to Egypt, but he was driven out for misrepresenting Sarai as his sister (Gen. 12:10–20). Again in Canaan, after quarrels beset Abram and Lot and their herdsmen, they separated, Lot remaining near Sodom and Abram continuing his nomadic life with renewed promises from God (Gen. 13:14–18). He later rescued Lot from the captivity of King Chedorlaomer of Elam, and was blessed by King Melchizedek of Salem (Gen. 14:8–16, 18–19). Then God, according to Gen. 15, promised Abram a son by his wife Sarai, repeated his earlier promises, and confirmed these by a covenant (q.v.).

Abraham about to sacrifice his son Isaac (from a 13th-century English book of Psalms) Pierpont Morgan Library

When this covenant was later renewed, the rite of circumcision (q.v.) was established, Abram's name became Abraham, and Sarai's became Sarah (Gen. 17). God subsequently repeated his promise of a male son by Sarah by means of visiting angels (Gen. 18:1–15).

When God informed Abraham that He intended to destroy Sodom and Gomorrah (q.v.) because of the wickedness of their inhabitants, Abraham pleaded with Him to spare the cities. Eventually it was agreed that God would spare the cities if He could find only ten righteous men (Gen. 18:17–32). The ten men could not be found, and God destroyed both cities.

Ishmael, first son of Abraham, whose mother was Hagar (q.v.), an Egyptian slave, was born when Abraham was eighty-seven years old (Gen. 16:16). Isaac (q.v.), born to Abraham by Sarah in his hundredth year, was the first of his legitimate descendants (Gen. 21:1–5). God demanded that Abraham sacrifice Isaac as a test of faith, but because of Abraham's unquestioning compliance, God permitted him to spare Isaac and rewarded Abraham with a formal renewal of his promises (Gen. 22 1–18) After Sarah died, Abraham married Keturah and had six sons by her He died at the age of 175, and was buried beside Sarah in the Cave of Machpelah, in what is now Hebron, Jordan (Gen 25 7–10)

Christians and Muslims, as well as the Jews, accept Abraham as an epitome of the man of unswerving faith The latter is reflected in such New Testament passages as Rom 4 11, Gal 3 7, Jas 2 21–23, and Heb 11 8–10

ABRAHAM IBN DAUD, *or* ABRAHAM BEN DAVID (1110?–80?), Jewish historian and philosopher, born in Toledo, Spain He was one of the first Jewish philosophers to introduce the Aristotelian system of knowledge to Judaism (*see* ARISTOTLE *Philosophy*) His philosophical work, written in Arabic, *Al-'akidah al-Rafiyah,* was preserved in a Hebrew translation as *Emanah Ramah* ("The Sublime Faith", 1168), this work influenced the Jewish philosopher Maimonides (q v) His chief historical work, *Sefer ha-Kabbalah* ("Book of Tradition", 1161), includes a history of the Jews in Spain

ABRAHAM LINCOLN BIRTHPLACE NATIONAL HISTORIC SITE, traditional birthplace of the sixteenth President of the United States, Abraham Lincoln (q v), 3 miles s of Hodgenville, Ky Enclosed in a memorial building is the log cabin in which Lincoln is believed to have been born in 1809 The site, covering 116 5 acres, was established as a national park in 1916, as a national historic park in 1939, and as a national historic site in 1959 The Abraham Lincoln birthplace is administered by the National Park Service (q v)

ABRAHAM, PLAINS OF. *See* PLAINS OF ABRAHAM

ABRAHAM'S BOSOM, Christian name for the abode of the blessed (Luke 16 19–31) It is also found in Jewish literature, but commentators disagree on whether it means heaven (q v) or simply the covenant of circumcisions (q v) The commonly accepted explanation of the term is that it reflects the custom current in Biblical times and lands for guests to recline at table so that the head of each leaned toward the breast of his neighbor. The honored guest, therefore, was said to lie in the bosom of his host In Byzantine art (q v), Abraham takes the souls of little children to his bosom

ABRAM. *See* ABRAHAM

ABRASIVE, substance employed in grinding or polishing an object by scraping or abrading

The traditional birthplace cabin of Abraham Lincoln near Hodgenville, Ky National Park Service

its surface Abrasives are usually very hard substances Some are used in the form of fine powders, others break in such a way as to form sharp cutting edges and are used in larger pieces Objects are ground to shape with a coarse abrasive, causing comparatively wide scratches on the surface of the object Polishing is done with a fine abrasive, to produce narrow scratches In each case the object must be softer than the abrasive Rouge and similar polishing agents are sometimes called abrasives, although they may be softer than the material that they are used to polish

Most natural abrasives are minerals corundum, diamond, emery, garnet, pumice, quartz, and sand, various types of diatomaceous earth (q v) have also been used Among the older synthetic abrasives are rouge, crushed steel, and powdered glass Since 1891 several synthetic abrasives (carbides, borides, nitrides) have been available These synthetic abrasives are almost as hard as diamonds and can be substituted for diamonds in every operation except the grinding of the diamond itself Among these are synthetic corundum, tungsten carbide, boron carbide, and silicon carbide, widely known as carborundum

ABRAVANEL. *See* ABRABANEL

ABRONIA, genus of low or trailing plants of the four-o'clock family, native to the western United States Species of *Abronia* are popular garden plants, and are commonly named sand verbenas They are grown as annuals in cool climates, in mild climates they are self-seeding The flowers, white, yellow, or pink, depending on the species, bloom through most of the summer They have a strong, pleasant odor

ABRUS, genus of tropical, climbing plants of the Pea family The species have pinnate leaves, white to reddish-purple flowers, and black-spotted, red seeds in flat pods They are cultivated in the southern part of the United States for garden screens and other ornamental effects The seeds of the Indian licorice, *A precatorius,* are used in making the beads of Buddhist rosaries, this use gives rise to its common names of prayer beads and rosary pea

ABRUZZI, region of Italy, in the south-central portion of the country, on the Adriatic Sea, comprised of four provinces named after their chief towns, L'Aquila, Chieti, Pescara, and Teramo Topographically, the region is comprised of two distinct areas The W portion, almost contiguous with the province of L'Aquila, consists of three ranges of the Apennines, including their valleys and basins Extending in a NW-SE direction, the highest range culminates at 9650 ft above sea level in Monte Corno, a peak of the Gran Sasso d'Italia section In the E, sand and clay hills slope gradually downward to a broad coastal plain on the Adriatic Sea encompassing the provinces of Chieti, Pescara, and Teramo The 100-mi coastline lacks good natural harbors The Pescara R , an important source of hydroelectric power, and the Sangro, Trigno, and Biferno rivers irrigate the lower valleys, all drain into the Adriatic Sea Sheep and cattle grazing and the cultivation of potatoes and wheat in the highlands, of corn, olives, grapes, and citrus fruits in the coastal valleys, and of sugar beets in the drained basin of Lake Fucino are the primary economic activities of the region Bauxite mining is extensive in L'Aquila Province

In the 4th century BC the inhabitants of the region were conquered by the Romans From the 6th to the 11th century AD the area was under the control of the Lombards, and in the 12th and 13th centuries it was part of the Norman kingdom of Sicily Governed as part of the kingdom of Naples from about 1240 to 1861, it was then incorporated into the unified kingdom of Italy The region of Abruzzi e Molise became the two separate regions of Abruzzi and Molise in 1963 Area, about 4170 sq mi ; pop (1971) 1,163,334.

ABRUZZI, Duke of the, in full LUIGI AMEDEO GIUSEPPE MARIA FERDINANDO FRANCESCO, DUKE OF THE ABRUZZI AND PRINCE OF SAVOY-AOSTA (1873–1933), Italian naval officer, mountaineer, and explorer, born in Madrid, Spain He made the first ascent of Mt Saint Elias, Alaska, in 1897 and two years later led an expedition toward the North Pole This expedition was the first to reach 86° 34′ N lat He was the first to climb (1906) the peaks of the Ruwenzori in Africa and set a world record in ascending Mt Godwin Austen, in Kashmir, to a height of 24,600 ft On Sept 30, 1911, he commanded the squadron that attacked Preveza, Greece, in the first action of the Italian-Turkish War He commanded the Adriatic fleet of the Italian navy in World War I

ABSALOM (fl about 10th cent BC), in the Old Testament, third son of David (q v), King of Israel and Judah According to the Bible (2 Sam 13–19), Absalom killed his brother Amnon for the rape of Tamar, their sister Later he rebelled against David and after driving the king out of Jerusalem was defeated in battle in the forest of Ephraim He was caught by his hair in an oak tree and killed by Joab, David's general David lamented his son with the words. "O my son Absalom, my son, Absalom' Would God I had

The dead Absalom, transfixed on Joab's spear after his hair was caught in an oak tree, is mourned by his father King David (from a 12th-century English Bible)

Pierpont Morgan Library

died for thee, O Absalom, my son, my son!" (2 Sam 18:33) *See* Bible *The Old Testament*

ABSALON *or* **AXEL** (1128–1201), Danish soldier, statesman, and ecclesiastic, born in Denmark and educated in Paris He was bishop of Roskilde, Denmark, from 1158 to 1178 and archbishop of Lund, Sweden, and in that capacity, primate of Scandinavia, from 1178 until his death Absalon served as minister and general during the reigns of the Danish kings Waldemar I (1131–82) and Canute VI (1163–1202) His most notable military exploits were the defeat of a fleet of Wendish pirates (*see* Wends) from Pomerania and Rugen in a Baltic Sea naval battle (1168) and the destruction of a Pomeranian force besieging the Danish-held Wendish city of Rugen (1184) At Absalon's suggestion the Danish historian Saxo Grammaticus (q v), who was also Absalon's secretary, compiled the famous chronicle of early Danish history known as the *History of the Danes* (about 1186)

ABSCESS, collection of pus, a thick yellowish fluid, in infected tissues of the body Abscesses are caused by bacterial organisms and may form in any internal or surface part of the body, *see* Bacteria, Infection Common sites of abscesses are the skin, the gums, and the abdominal organs The area of the abscess becomes inflamed, that is, red and swollen, sensations of pain, caused by the pus pressing on nerve endings, and localized heat are common If the inflamed tissue wall encompassing the infected cavity thins out sufficiently, the abscess may spontaneously rupture, causing the pus to drain, or escape Medical treatment may involve the use of antibiotics and surgical incision *See* Antibiotic, Carbuncle, in medicine

ABSENTEE BALLOT, instrument on which a qualified voter indicates his voting choice by mail if he cannot be present at the polls on election day Such a person, upon application, receives his ballot from a designated county official, and returns it before a specified time Most States in the United States provide for absentee balloting *See* Ballot

ABSINTHE, liquor flavored with pounded leaves and flowering tops of certain species of plants belonging to the genus *Artemisia,* chiefly wormwood, together with angelica root, sweet-flag root, star anise, and other aromatics (*see* Essential Oil) The aromatics are macerated for about eight days in alcohol and then distilled, the result being green-colored liquor Absinthe is prohibited in the United States, France, and Canada because habitual use causes mental and physical debility

ABSOLUTE, term used to denote whatever is in no way dependent or limited by anything else Thus, in ethics an absolute value is one that is good in itself rather than useful for obtaining something else, and an absolute principle is one that permits of no exceptions In political theory an absolute right is a right that society cannot take away from an individual

In theology and metaphysics (qq.v) the term "the Absolute" usually refers to God. According to the Dutch philosopher Baruch Spinoza (q v), God is absolute, that is, unlimited, because by His very concept, nothing can limit God All other existing things exist through this absolute substance The German philosopher Immanuel Kant (q v) defined the Absolute as an all-encompassing totality and argued that scientific knowledge of such a being is impossible This position was adopted also by the British philosophers Herbert Spencer (q v) and Sir William Hamilton (1788–1856) The Absolute figures also as the central concept in the philosophies of the 19th-century German idealists, *see* IDEALISM In particular, the German philosopher Georg Wilhelm Friedrich Hegel (q v) regarded the Absolute as a spiritual process that realizes itself through rationality alone, because only through the use of logic (q v) could reality be recognized He maintained, as did the British idealist philosophers Bernard Bosanquet (1848–1923), Thomas Hill Green (1836–82), and Francis Herbert Bradley (1846–1924), that all knowledge is indirectly and incompletely knowledge of the Absolute The American idealist philosopher Josiah Royce (q v), identified the Absolute with a so-called cosmic community, his system of philosophy came to be known as absolute idealism R A

ABSOLUTE TEMPERATURE. *See* HEAT *Temperature Scales*

ABSOLUTE ZERO, lowest temperature theoretically possible, characterized by complete absence of heat at approximately −273 16° C (−459 69° F), or zero degree on the Kelvin scale, *see* HEAT *Temperature Scales,* TEMPERATURE The concept of absolute zero temperature was first deduced from experiments with gases, when a fixed volume of gas is cooled, its pressure decreases with its temperature Although this experiment cannot be conducted below the liquefaction point of the gas, a plot of the experimental values of pressure versus temperature can be extrapolated to zero pressure The temperature at which the pressure would be zero is the absolute zero temperature This experimental concept of a gas-thermometer temperature scale and of absolute zero was subsequently shown to be consistent with the theoretical definitions of absolute zero *See* KELVIN, 1ST BARON, WILLIAM THOMSON

Absolute zero cannot be reached experimentally, although it can be approached very closely. Special procedures are needed to reach very low or cryogenic temperatures, *see* CRYOGENICS Liquid helium (q v), which has a normal boiling point of 4 3° K (−268 9° C) can be produced by cryostats based on a design by the American mechanical engineer Samuel Cornette Collins (1898–   ) If the helium is then evaporated at reduced pressures, temperatures as low as 0.7° K can be obtained Temperatures lower than these require the adiabatic demagnetization of paramagnetic substances, such as chrome alum, while they are being surrounded with a liquid helium bath, *see* THERMODYNAMICS The method, which was first developed by the Canadian-American chemist William Francis Giauque (q v) in 1937, utilizes a magnetic field which initially aligns the ionic magnets of the material If the magnetic field is removed, the magnets again assume their random orientation, reducing the thermal energy of the material and thus its temperature Temperatures as low as 0 002° K have been reached with the demagnetization of paramagnetic salts, and the demagnetization of atomic nuclei has yielded temperatures as low as 0 00001° K

Temperature measurements at values close to absolute zero also present special problems Gas thermometers can only be used up to the liquefaction point of helium At lower temperatures, electric and magnetic measurements must be used to determine the effective temperature

The concept of absolute zero temperature is also important in theoretical considerations According to the third law of thermodynamics, the entropy of a pure crystal is zero at absolute zero temperature; this is of considerable importance in analyzing chemical reactions and in quantum physics, *see* QUANTUM MECHANICS, QUANTUM THEORY, REACTIONS, CHEMICAL F La

ABSOLUTION, term in Christian theology, most often used to refer to sacramental absolution, the judicial act in the sacrament of Penance (q v), by which the priest, as the minister of God, grants to the confessing penitent forgiveness of his sins In the Roman Catholic and Eastern Orthodox churches, under ordinary circumstances, sacramental absolution is considered essential To be effective, however, absolution supposes a true contrition for sin and a firm purpose of amendment on the part of the penitent. Absolution is optional in the Anglican Church, which holds that this is only one means to obtain forgiveness of sins Most Protestant denominations do not hold penance as a sacrament, and therefore do not acknowledge the necessity for sacramental absolution Most denominations recognize a broader interpretation of absolution, that is, the remission of the sins of a repentant sinner They believe this remission is achieved, not by the mediating judicial act of a minister or priest, but by direct acknowledgment by the penitent of his transgressions to God and humble entreaty for His forgiveness Absolution as a term seems to be confined to Christian theology However, the concept of penitently beseeching a deity's forgiveness for individual offenses is common to almost all religions

In the Roman Catholic Church, absolution can also mean release from ecclesiastical censure (penalty imposed on one who commits any of certain extremely serious sins specifically condemned as crimes in canon law) or the rite immediately following a funeral Mass in which the mercy of God is implored for the soul of the dead V F

ABSOLUTISM. *See* POLITICAL SCIENCE

ABSORPTION, in chemistry, the taking up of one substance by another For example, a gas such as oxygen may be absorbed, or dissolved, in the blood The oxygen molecules ultimately become attached to hemoglobin molecules and the oxygen then loses all its distinctive characteristics

In physics, absorption denotes the taking up of energy, such as light, heat, or other radiant energy, by an object The absorbed radiation is converted into heat, the radiation that is reflected has changed characteristics For example, sunlight striking an object will usually have some of its wavelengths absorbed and other wavelengths reflected If the object looks white, it is because all, or nearly all, of the radiation is reflected If the object appears to have any color other than white, however, it shows that all the visible radiation has been absorbed except for those wavelengths that give rise to a color sensation when they strike the eye (*see* COLOR, VISION) Objects that absorb all the radiation striking them are known as black bodies

Adsorption, which is often confused with absorption, refers to the adhering of gases to the interior surfaces of porous solids, as activated carbon adsorbs certain gases Adsorption is a surface phenomenon, absorption is an intermingling or interpenetration of two substances

ABSTRACT AND NONOBJECTIVE ART, art that employs forms or images having no direct reference to external or perceived reality The terms abstract and nonobjective refer especially to art of the 20th century. In France these terms are used more or less synonymously In the United States, however, the term nonobjective always refers to art that has no recognizable naturalistic imagery, whereas the term abstract sometimes is applied also to works in which the images have been abstracted, or basically derived, from such recognizable sources as the human figure, the landscape, or still-life objects, but have been greatly altered

Early Tendencies. Purely nonobjective art developed in Europe during the first decades of the 20th century, but the tendency to abstract from perceived objects has been present in the art of all countries throughout history In the Orient, for example, artists normally abstracted when they painted landscapes and flowers, they sought to express the principle of growth when painting a flower or the weight of a mountain when painting a landscape, rather than to reproduce a likeness In the West, the Renaissance (q v) interest in science, and particularly in the newly perfected techniques of perspective painting, prompted artists to try to render a faithful replica of what they saw

Realism (q v) in one form or another dominated Western art until well into the 19th century, when artists began to consider the problems of expressive rather than descriptive painting The invention of photography, the tremendous discoveries of science concerning the nature of the universe, and the highly abstract trend of philosophy during the period all favored the rise of abstract art Certain artists concluded that the main purpose of art is to represent the essential qualities of a subject by means of abstract forms and symbols rather than to render its external appearance realistically The French painter Paul Cézanne (q v) and various other artists deliberately sought to penetrate surface appearances and even to sacrifice surface beauty in order to reach essential forms Another group of artists also turned away from imitative realism, but in the direction of decorative composition The theory of the French painter Paul Gauguin (q v), expressed by his compatriot, the painter Maurice Denis (q v), was that "a picture—before being a battle horse, a nude woman, or some anecdote—is essentially a plane surface covered with colors assembled in a certain order"

This new concept of a picture as something inherently valid apart from its objective content was developed by the cubists (*see* CUBISM), notably the Spanish painter and sculptor Pablo Picasso (q v), who in his early period analytically rendered bottles, guitars, or tables as flat shapes organized in rhythms he himself created The cubists thought of a painting as an independent entity, but they used concrete, recognizable forms as their basic elements in building that entity The Fauvists (*see* FAUVISM), working during the same period, also clung to the external appearance of objects but, through nonnaturalistic color, tried to express more profound emotion

Kandinsky and Mondriaan. The complete liberation of painting and sculpture from external reference was accomplished by other artists Of these the most influential were the Russian

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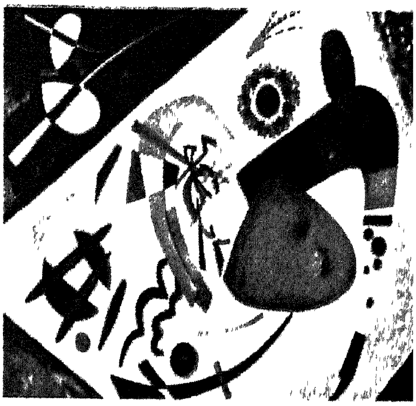

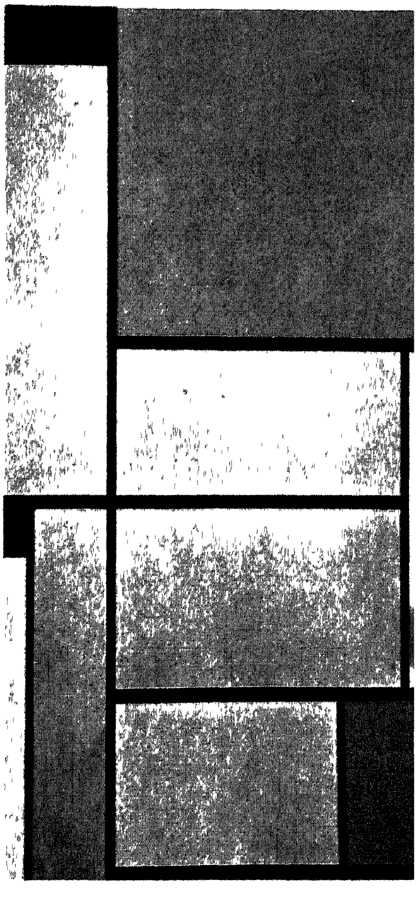

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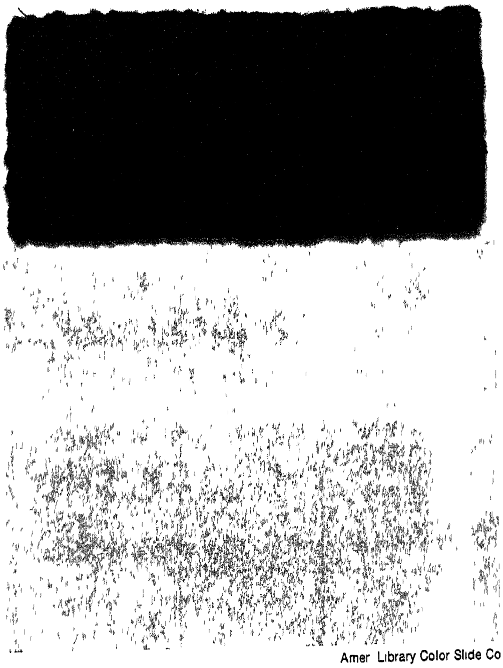
Abstract Art. Plate 1. *Four paintings that illustrate the wide variety of abstract approaches to color, line, composition, and perspective in American and European art Top, left "The Mirror" (1957), by Philip Guston Top, right "Red Spot II" (1921), by Vasily Kandinsky Left "Red and Blue" (1953), by John Ferren Above "Tableau I" (1921), by Pieter Cornelis Mondriaan*



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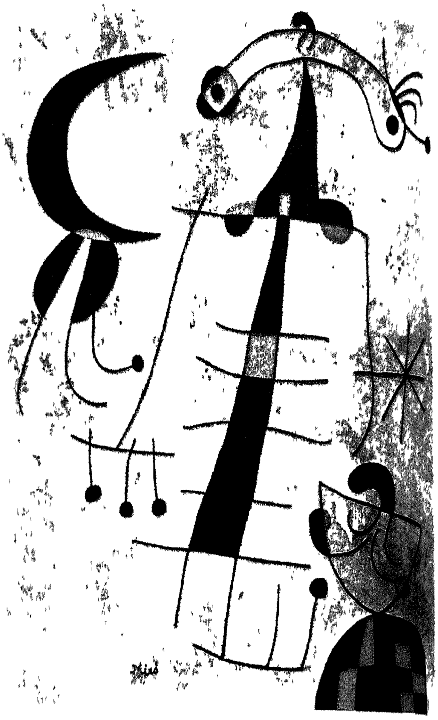
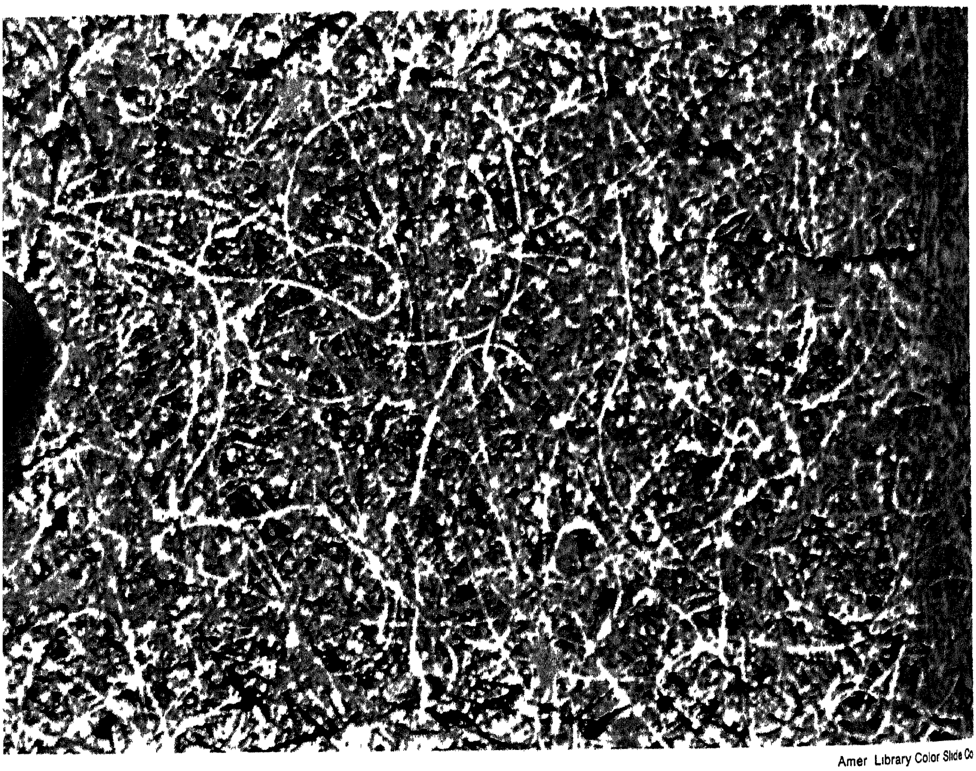
"Black Over Reds" (1957), a warm and deeply radiant painting by Mark Rothko



"Lover's Complaint" (1943), a lighthearted painting, open to fanciful interpretation, by Joan Miro

Abstract Art. Plate 2.

"Number 1" (1943), a large, vigorous painting with intricate, rhythmic networks of lines by Jackson Pollock



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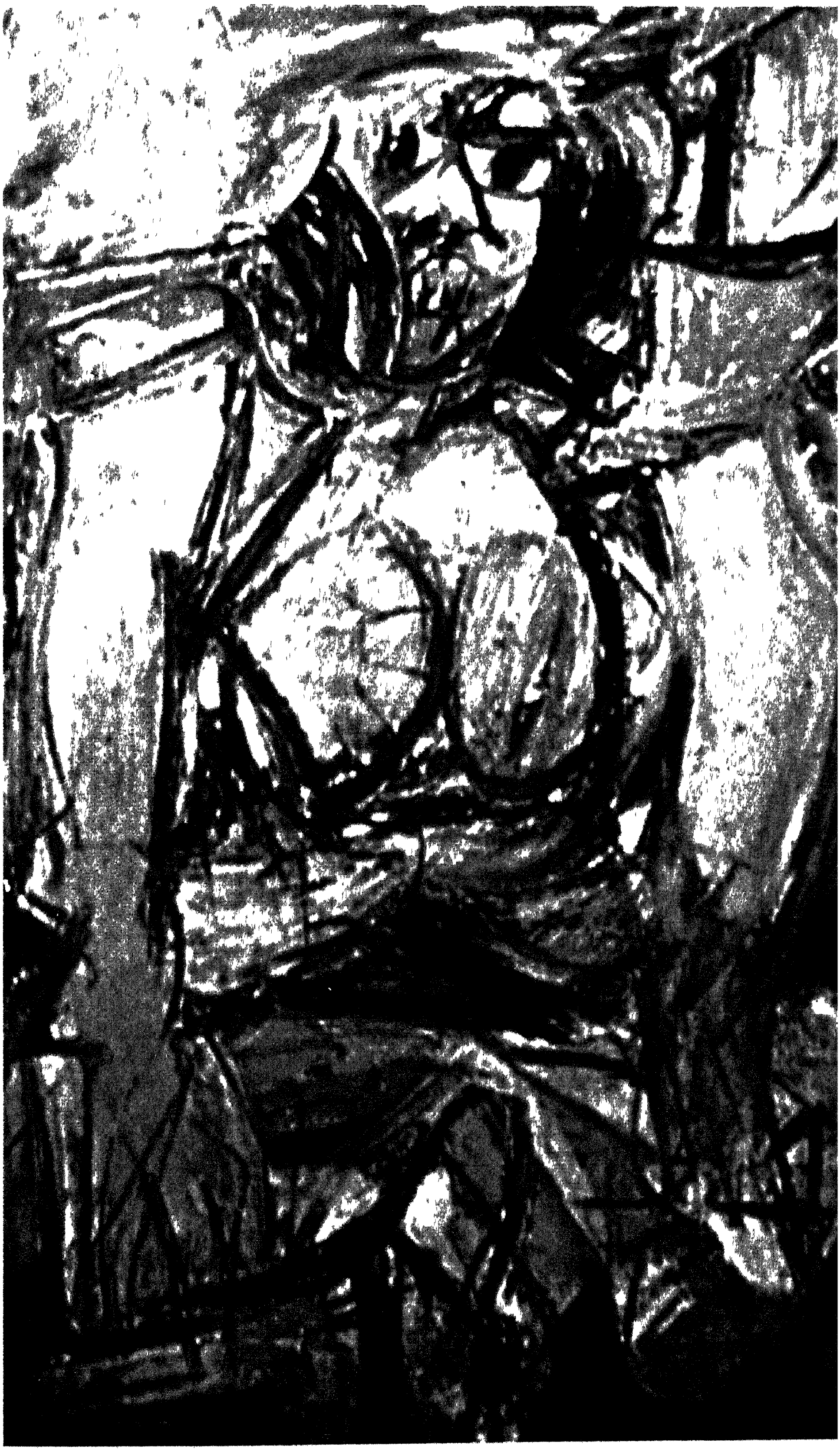

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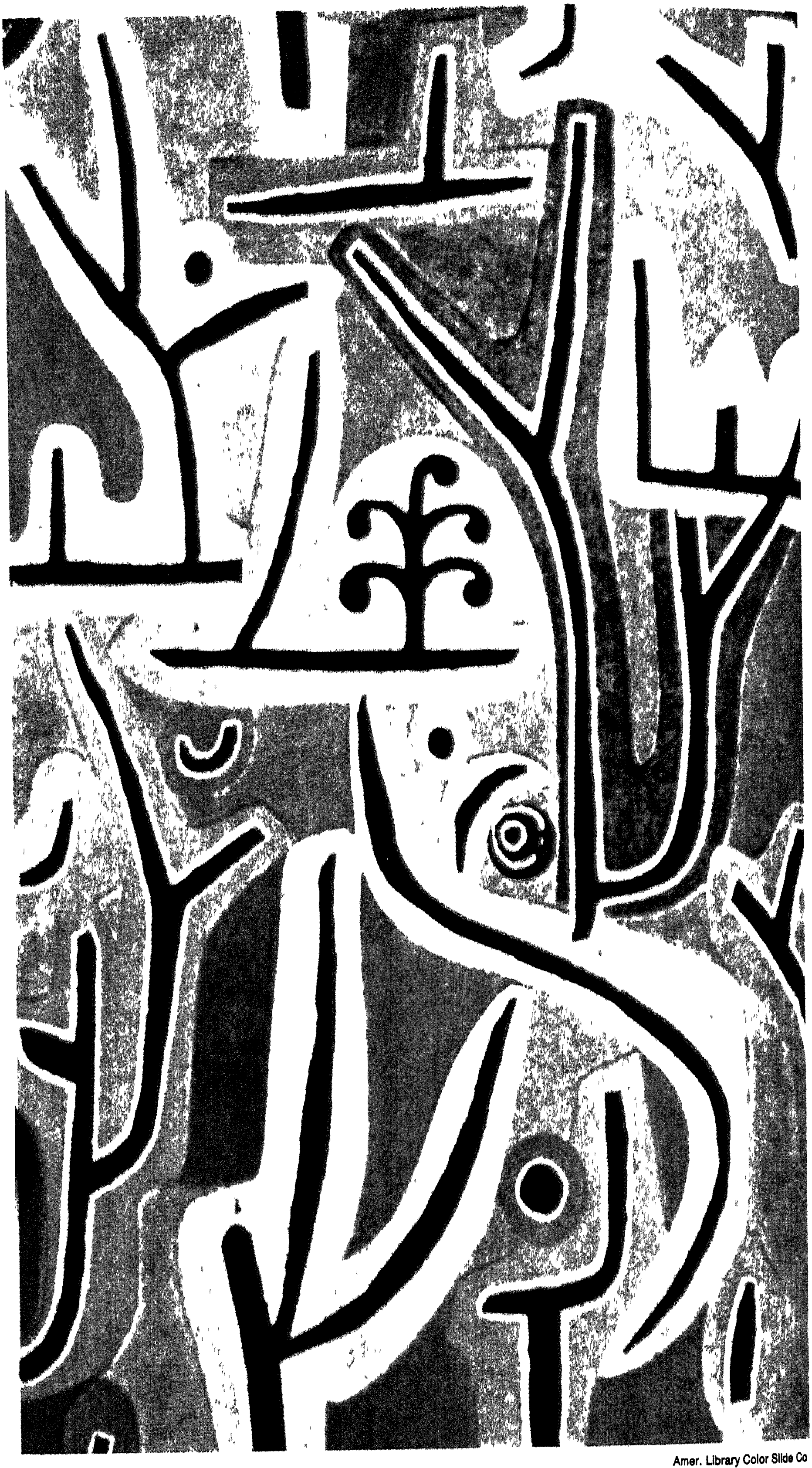
Abstract Art. Plate 3. *"Woman IV" (1953), a highly abstracted yet recognizable figure painting by Willem de Kooning The work is part of a series, "Woman", which was acclaimed for its innovations in portraying the human form*



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Abstract Art. Plate 4. *"Park Near Lucerne" (1938), a painting with simple motifs suggesting trees and paths by Paul Klee The Swiss painter was one of the important early experimenters of the abstract school* painter Vasily Kandinsky and the Dutch painter Pieter Cornelis Mondriaan (qq v) The divergent theories of these two men respectively express the essence of the two major branches in abstract art the organic art of freely invented forms moving in imaginary spaces and the structural art of defined shape (often geometric) and color

In 1910 Kandinsky arrived at a conception of completely abstract art, which he defined in his book *Concerning the Spiritual in Art* (1912) Kandinsky claimed for the visual arts the same freedom found in music He argued that form and color may be used to achieve a psychological effect similar to that of music, which "vibrates in the human soul" Abstract art "creates alongside the real world a new world which has nothing to do *externally* with reality It is subordinate *internally* to cosmic laws"

Mondriaan made his departure from tradition just before World War I Analyzing the structure of an object against a horizon, he found that the principles of the vertical and horizontal were stronger when abstracted from their representational function By 1917 he had reduced the elements in his painting to the two dominating rhythms, vertical and horizontal, that produce tension by their intersection A founder in that year of de Stijl, a group of Dutch artists, which fathered all later geometric abstraction, Mondriaan wrote in the *de Stijl* magazine that the "plastic means" of all painting, past and present, are only line and color Only through the totally nonobjective means of primary color and straight line, he felt, can modern man express universality, the unity of the spirit, and the balanced relationships of the cosmos In speaking of new plastic means, Mondriaan gave a name to what is known as the neoplastic school

Other Experimenters. Although Mondriaan and Kandinsky have emerged as towering figures in the early history of nonobjective art, other men and movements contributed to the expression of the feeling of their time In Russia about 1909, Kazimir Severinovich Malevich (1878–1935) gave form to the movement toward ultimate simplicity when he invented the term suprematism He reduced art to a presentation of the most elementary forms, the circle and the square In Italy, also about 1909, the futurists (*see* FUTURISM) proclaimed in their manifestoes an era of freedom in art, demanding that the artist "despise utterly every form of imitation" and devote himself to the expression of the "universal dynamism" of modern life In Germany, the Hungarian painter and designer László Moholy-Nagy, the Swiss painter Paul Klee, the German-American architect Walter Adolf Gropius (qq v), Kandinsky, and others created the Bauhaus (q v), an institute which functioned from 1919 to 1933, fostering experiments in abstract art in painting and sculpture as well as in architecture and applied arts

The flowering of "isms" in the first half of the 20th century reflected the new relationships to the universe that were being established in both the natural and physical sciences, as well as an increasingly marked interest in psychology The theory of the unconscious developed by the Austrian physician and psychoanalyst Sigmund Freud (q.v) and the complementary theories of the Swiss psychoanalyst Carl Gustav Jung (q v) were influential in such artistic experiments as those undertaken by the surrealists (*see* SURREALISM) in "automatism" Direct expression of the intimate activities of the psyche was sought by such artists as the Spanish painter Joan Miró (q v) and the French painter-sculptor Jean Arp (q.v), both of whom deployed abstract forms to reflect a state of mind rather than render an objective impression

Styles After World War II. The dominant mode emerging after World War II had its roots in the free emotional expression proposed by Kandinsky and was nourished by surrealist preoccupations In Europe the expressionist vision was epitomized by the German painter Wols (real name Wolfgang Schulze, 1913–51) whose small, cosmic compositions were, in spirit, somewhat related to the works of the American painter Mark Tobey (1890-1976) Other Europeans, generally grouped under the rubric "informalists" (Art Informel), included Pierre Soulages (1919–), Jean Dubuffet (q v), and Nicholas de Stael (1914–55), who sought to displace the logical structures of both the cubists and the nonobjective structuralists in order to expose and explore the inner world of the mind as well as the infinite variety of sense experience. In the U S a comparable rejection of the cubist mode gained momentum during World War II when such artists as Hans Hofmann, Jackson Pollock (qq.v), and Arshile Gorky (Vosdanig Adoian, 1904–48) experimented with expressionist abstraction Pollock developed a unique approach to the picture space based on interlacing lines that seemed to extend in an infinite arabesque Willem de Kooning (q v), using broad impasto strokes, also broached virtually infinite spaces in his rhythmic abstractions of the late 1940's, and Mark Rothko (q v) developed great glowing surfaces that seemed animated by an inner light radiating into the surrounding space These painters, along with colleagues such as Bradley Walker Tomlin (1899–1953), Franz Josef Kline (1910–62), Philip Guston (1912–), Clyfford Still (1904–), Robert (Burns) Motherwell (1915–), and Adolph Gottlieb (1903–74) formed the nucleus of a movement that came to be called "abstract expressionism" or "The New York School" All of these painters were primarily concerned with representing their reactions to the world, their emotional experiences rather than the objective facts that occasioned them

Developments After the 1950's. The tremendous sweep of informal intuitional approaches after the war subsided during the late 1950's when many artists began to retrieve the more formal, geometric tradition rooted in the work of the Russian constructivists (*see Modern Abstract Sculpture* below) and the Dutch members of *de Stijl*. In Europe there was a new interest in the work of the Hungarian-born French painter Victor Vasarely (1908–) and his followers, many of whom experimented with kinetic or optical effects on the two-dimensional plane Vasarely's "concrete" art also served to stimulate experiments in three dimensions based largely on sensory responses to movement and color and deliberately divested of literary connotations In the U S those members of the abstract-expressionist generation who had developed the most severely reduced vocabularies were the "hard-edge" painters such as Barnett Newman (1905–70), whose giant canvases were often bisected by a single line, and Ad Reinhardt (1913–67) who, toward the end of his life, painted only in colors of such low values as to appear black Their work became the inspiration for younger painters eager to depart from the emotional excesses of the pioneers This cool, objective trend in painting was developed by a number of young artists who worked in mathematical sequences, or series of canvases, in a dry and preplanned manner As if in answer, a whole new generation of lyrical abstractionists appeared in the late 1960's, many of them inspired by the color experiments of Morris Louis (1918–62) on unprimed canvas.

Modern Abstract Sculpture. Abstract and nonobjective tendencies in sculpture appeared

"Crag with Yellow Boomerang and Red Eggplant" (1974), mobile by Alexander Calder, who added the grace of motion to an original assemblage of steel wire and sheet aluminum shapes Mobiles, designed to move when touched or blown by a breeze, have added a space-time concept to sculpture

Perls Gallery, N Y

simultaneously throughout Europe just before World War I Some artists followed the Rumanian sculptor Constantin Brancuşi (q v) in developing free forms suggested by the inner structures of natural forms Brancuşi's ovoid shapes in stone and bronze later inspired such artists as Arp and the American Isamu Noguchi (q v) A more constructive mode grew out of the early experiments of Picasso with collage reliefs fashioned from scraps of tin, wood, and cardboard The Russian constructivists were directly influenced by Picasso, but tended, as did their leader Vladimir Tatlin (1885–1953), toward monumentally scaled visions of weightless, soaring abstract structures with architectural implications The brothers Naum Gabo (Naum Pevsner, 1890-1977) and Antoine Pevsner (1887-1962) worked with slender lines in space and experimented with new materials, such as transparent plastics, in order to reveal interior space and redefine the traditional conceptions of volumetric mass Such exploration in new directions was extended by Americans such as Alexander Calder (*see under* CALDER), whose invention of the mobile created a new definition of sculpture, David Smith (q v), whose monumental play with iron and steel abstract forms paralleled the works of his abstract-expressionist colleagues during the 1940's and 1950's, and Louise Nevelson (q v), whose wood assemblages of boxed forms later emerged in great steel compositions In England Henry Moore (q v) had long developed massive abstractions based on natural and human forms, as had Barbara Hepworth (q v) During the 1960's, welded sculpture received strong impetus from the works of Anthony Caro (1924–), who removed his work from pedestals and set his sculptures in spaces that seemed appropriate to the new industrial forms Less conventional developments in sculpture during the 1960's and early 1970's included a new genre dubbed "earth art", in which the artists worked directly in the landscape: creating stone configurations in running streams; building artificial mountains in the desert, modifying waterfalls (by means of steel wires), and ploughing designs into abandoned fields *See also* ART *The Modern Era* D.A.

ABSTRACT OF TITLE, in law, a brief and orderly statement in writing of the successive conveyances and other events concerning real property (land) An abstract of title should furnish a complete history of the title to be transferred, showing not only the origin and nature of the interest of the seller, but also all encumbrances and other interests, such as mortgages, easements, recorded judgments, and trusts (q v) that affect his title (*see* JUDGMENT, MORTGAGE) In the United States, public records provide the information for an abstract of title After entering into a contract of sale, a purchaser of land generally employs a lawyer or a title-abstract company to make a search of the title, and to make a report thereon, which usually includes an abstract of title If a company is employed, it may also guarantee the title by assuming financial responsibility for any defects in the title not revealed in the search The purchaser then either closes the contract of sale, or he refuses to accept the title because of defects shown in the abstract or refuses to accept it until such defects are cured by the seller A similar procedure is generally followed by a mortgagee before lending money on a mortgage In these cases the fee for the title search is usually paid by the mortgagor

ABT, Franz (1819–85), German conductor and composer, born in Eilenburg and educated in Leipzig. He served as conductor of the court theater orchestras in Bernburg and Brunswick, Germany, and in Zurich, Switzerland He toured the United States in 1872, conducting several choral societies Abt composed thousands of songs, many of which are notable for the simplicity and clearness of their melodic construction Among the best known are "When the Swallows Homeward Fly", "Good Night, Thou Child of My Heart", and "Sleep Well, Sweet Angel"

ABU-'ABDULLAH. *See* BOABDIL

ABU-AL-ABBAS. *See* ABBAS

ABU-BAKR *or* **ABU BEKR** (573–634), first Muslim Caliph (632–34), and father of Aisha (q.v), the wife of the Prophet Muhammad (q v). He was born in Mecca and became Muhammad's most trusted follower In 632, when Muhammad died, Abu-Bakr was made the first caliph, or successor of the Prophet, by an assembly of the faithful As caliph, Abu-Bakr prevented some tribes from reverting to heathenism and fought successfully against Persia and the Byzantine Empire He was succeeded by Omar I (581?–644) *See* CALIPH.

ABUKIR. *See* ABU QIR

ABULFARAJ. *See* BAR-HEBRAEUS, GREGORIUS

ABULFEDA *or* **ABULFIDA** (Ar *Abu-al-Fidā*) (1273–1331), Arabian historian and geographer, born in Damascus (now in Syria) He took part in the sieges of Tripoli (1289) and Acre (1291), the last strongholds of the Crusaders (*see* CRUSADES) In 1310 Abulfeda was appointed governor of the city of Hama (q v.), over which he ruled with almost absolute power In 1312 he was made prince, and in 1320 he was given the title of sultan and the right to transmit the title to his descendants. Abulfeda's most important work was *An Abridgment of the History of the Human Race,* a text that traces the history of mankind until 1329. This work is especially valuable as a historical source for the period of the Crusades. He also wrote *Geography,* which is valued primarily for a description of the Muslim world.

ABU QIR, *or* ABUKIR, bay on the N. coast of the Arab Republic of Egypt, between the Rosetta mouth of the Nile R. and the city of Alexandria. Abu Qir Bay was the scene of the defeat of the French fleet by British forces under the command of Admiral Horatio Nelson (q.v.) in the Battle of the Nile, on Aug. 1–2, 1798 (*See* NILE, BATTLE OF THE). The following year the French emperor Napoleon I (q.v.) defeated an Arab army at the village of Abu Qir, which is on the shore of the bay, about 13 miles N.E. of Alexandria. The ancient Egyptian temple city of Canopus was located near Abu Qir.

ABU SHEHR. *See* BUSHIRE.

ABU SIMBEL *or* **IPSAMBUL,** site of two temples in the Arab Republic of Egypt, on the Nile R., about 170 miles S. of Aswân. The temples were carved into a sandstone cliff about 1250 B.C. during the reign of Ramses II (*see under* RAMSES). The interior of the larger temple is over 180 ft. in depth and consists of a series of halls and chambers leading to a central sanctuary. This temple was dedicated by Ramses II to the chief gods of Heliopolis, Memphis, and Thebes. It is oriented so that the rays of the rising sun illuminate the statues of the three gods and of Ramses II in the innermost sanctuary. The smaller temple was dedicated by Ramses to his queen, Nefertari (fl. 13th century B.C.) and to the goddess Hathor, *see* EGYPTIAN RELIGION. The facade of the larger temple has four sitting statues of Ramses II, each over 65 ft. in height. Smaller statues of Ramses II, Nefertari, and their children adorn the facade of Nefertari's temple. The larger temple has numerous inscriptions and reliefs, some of them of unusual historical interest. A series of reliefs depicts the battle between the Egyptians and the Hittites (q.v.) at Kadesh. Two of the large sitting statues of Ramses have inscriptions in Greek dating from the 6th century B.C. They were written by Greek mercenary soldiers and are among the earliest dated Greek inscriptions.

The temples, the most important monuments of ancient Nubia (q.v.), were unknown to the West until 1812 when they were discovered by the Swiss traveler Johann Ludwig Burckhardt (1747–1817). In 1964 an international project was begun to save the temples from inundation by Lake Nasser, the reservoir of the Aswân High Dam (q.v.). In a remarkable engineering feat, the temples were cut apart and, in 1968, reassembled on a site 210 ft. above the river.

ABUTILON, genus of tender shrubs, in the family Mallow (q.v.), commonly known as flowering maple. About seventy species are recognized, native to warm regions of both hemispheres. They have long-stemmed, lobed leaves, and bell-shaped flowers of various colors about 1 to 3 in. long. In subtropical regions of the United States they grow in gardens, in cooler regions they are grown in greenhouses and as houseplants. Indian mallow, *A. theophrasti,* yields a coarse fiber used for cordage.

ABYDOS, name of two ancient cities. **1.** City in Asia Minor, on the Hellespont (now Dardanelles), opposite the ruined town of Sestos. The Persian ruler Xerxes I (q.v.) bridged the Hellespont at Abydos in 480 B.C., in order to invade Greece. In Greek legend, Abydos is celebrated as the scene of the story of Hero and Leander (*see* HERO). **2.** City of Egypt, on the W. bank of the Nile R., about 100 miles N. of the ancient city of Thebes. It was founded in prehistoric times, as evidenced by various archeological discoveries, including royal tombs. Most of the Egyptian kings of the I and II Dynasties (3400?–2980 B.C.) were buried there. Between the I Dynasty and the end of the XXVI Dynasty (525 B.C.) one section of the town was the site of nine successive temples. The Great Temple of Abydos, constructed on another site during the reign (1313–1292 B.C.) of Seti I (*see under* SETI), is in remarkably good condition.

ABYSSINIA. *See* ETHIOPIA.

ACACIA, important genus of trees or shrubs, of the family Leguminosae (q.v.). Most of the 450 species of the genus are native to tropical Africa or Australia. The normal type of leaf is bipinnate, but it is often modified, especially among the species which have had to adapt to the intense heat and drought of Australia. The Australian species have vertical phyllodia (leafstalks) instead of leaves. The genus is of great and varied economic importance, yielding edible seeds and valuable timber and gum.

ACADEMIC FREEDOM, right of teachers and research workers, particularly in colleges and universities, to investigate their respective fields of knowledge and express their views without fear of restraint or dismissal from office. The right rests on the assumption that open and free inquiry within a teacher's or researcher's field of study is essential to the pursuit of knowledge and to the performance of his proper educa-

Nenadovic–UNESCO

E Streichen

Abu Simbel Two ancient temples of Ramses II were dismantled in 1964–66 and moved 210 ft above their original sites to protect them from waters backed up behind the Aswân High Dam Top The four seated figures in the facade of the larger of the two temples, more than 65 ft high, represent Ramses Left A portion of one of the statues of Ramses is moved

tional function At present this right is observed generally in countries in which education is regarded as a means not only of inculcating established views but also of enlarging the existing body of knowledge The concept of academic freedom implies also that tenure of office depends primarily on the competence of a teacher in his field and on his acceptance of certain standards of professional integrity rather than on extraneous considerations such as political or religious beliefs or affiliations

The concept and practice of academic freedom, as recognized presently in Western civilization, date roughly from the 17th century Although academic freedom existed in universities during the Middle Ages, it signified at that time certain juristic rights, for example, the right of autonomy and of civil or ecclesiastical protection enjoyed by the several guilds that comprised a *studium generale,* or *universitas* (*see* UNIVERSITIES AND COLLEGES) Prior to the 17th century, intellectual activities at universities were circumscribed largely by theological considerations, and opinions or conclusions that conflicted with religious doctrines were likely to be condemned as heretical In the late 17th century the work of such men as the English philosophers John Locke and Thomas Hobbes (qq.v.) helped pave the way for academic freedom in the modern sense. Their writings demonstrated the need for unlimited inquiry in the sciences and for a general approach to learning unimpeded by preconceptions of any kind. However, neither Locke nor Hobbes defended unlimited academic freedom. The German universities of Halle and Gottingen, founded in 1694 and 1737 respectively, were the first European universities to enjoy broad academic freedom, with few lapses, from their inception. The University of Berlin, founded in 1810, introduced the doctrine of *Lehr- und Lernfreiheit* ("freedom to teach and study") and helped to strengthen Germany's position as the leader of academic freedom in the 19th century. In the 18th and 19th centuries universities in Western Europe, Great Britain, and the United States enjoyed increasing academic freedom as acceptance of the experimental methods of the sciences became more widespread and as control of institutions by religious denominations became less rigorous. In Great Britain, however, religious tests for graduation, fellowships, and teaching positions were not abolished until late in the 19th century.

During the first half of the 20th century academic freedom was recognized broadly in most Western countries. However, infringements of the right increased as totalitarianism (q.v.) emerged in various countries, notably in Germany, Italy, and the Soviet Union. Educators in Italy were forced to pledge support to the Fascist regime; *see* FASCISM. Similar restrictions, including the teaching of racist theories in some fields, were enforced in German universities under National Socialism (q.v.). In the Soviet Union academic freedom was and is limited by the necessity of making all instruction and research conform to particular Communist doctrines in every field of learning. From time to time the politburo of the central committee of the Soviet Communist Party lays down decrees establishing the sanctioned Marxist-Leninist viewpoint in various academic disciplines.

Infringements of academic freedom occurred also in the U.S. in the 20th century. A notable example was the conviction, in the Scopes trial, held in Dayton, Tenn., in 1925, of a high-school teacher accused of violating a State law that forbade the teaching of the theory of evolution in the public schools; *see* BRYAN, WILLIAM JENNINGS; FUNDAMENTALISM. Since that time this legislation has remained unenforced. After World War II there was widespread fear that members of the Communist Party had infiltrated the field of education, and some educators were accused of Communist Party membership or of being under Communist Party discipline. A number of teachers so accused were dismissed on the ground that their official instructions as party members required them to use their teaching positions for purposes of Communist indoctrination, and that they were consequently guilty of violating professional ethics. In the early 1950's, largely because of Congressional investigations of Communism in the U.S., many institutions of higher learning adopted regulations requiring loyalty oaths from members of their faculties. Some of these oaths, insofar as they were required only of teachers, were declared unconstitutional in some State courts. However, the right of Congress to question teachers about their membership in the Communist Party was upheld by the U.S. Supreme Court.

During the 1960's and early 1970's, in the U.S. and other countries, groups of students asserted their right to what they conceived to be academic freedom for students, claiming an active role in determining policy on curriculum, examinations, evaluation of professors, student life and behavior, and privileges. They often accompanied their demands with demonstrations and even violence. Consequently, theirs seemed the dominant voice, though in the U.S. the majority of college students remained moderate and nonviolent. In many countries the tendency was to grant concessions to students more for the sake of peace than out of principled agreement. As a result, students began to enjoy more freedom of expression not only in political matters, which in English-speaking and some Asian countries they already enjoyed, but in educational matters as well. Some academicians and social critics considered this the era of student power and the decline of the faculty as the ultimate authority.

With the end of the participation of American troops in the war in Vietnam in 1973 and the termination of the draft, a marked change occurred in U.S. student attitudes. For the most part, activists lost their influence, and students returned to the traditional preoccupations of academic life, demonstrating a single-minded interest in their studies. In Western Europe, however, the unrest continued, with extremists terrorizing faculties and taking over administrations in some of the world's oldest centers of learning.

All professional associations of teachers and administrators, including the National Education Association, the American Association of Colleges, and the American Association of University Professors, are opposed to special loyalty oaths and to all violations of academic freedom There is a general consensus that the faculties of institutions of higher learning are the bodies best qualified to enforce the standards of professional ethics and integrity S H & W W B

ACADEMY, originally, in ancient Greece, a public garden outside of Athens, dedicated to Athene and other deities and containing a grove and a gymnasium In these gardens the Greek philosopher Plato (q v) met with and instructed his followers, and his informal school came to be known as the Academy Subsequent schools of philosophy, modeled upon Plato's, were also called academies, the term was eventually used in ancient times to indicate any institution of higher education or the faculty of such an institution The most notable academies of the ancient world were the Old Academy, founded by Plato, the Middle Academy, founded by the Greek Platonic philosopher Arcesilaus (316–241 BC), and the New Academy, founded by the Greek skeptic philosopher Carneades (q v)

As a term used to denote a school, the word "academy" has come to be applied to certain kinds of institutions of learning The *Ritterakademien*, or schools for knights, appeared increasingly in Germany after the end of the Thirty Years' War in 1648 The term "academy" was adopted in England during the late 17th and in the 18th centuries by Puritan religious sects as a name for secondary schools that they organized to provide for the general education of their children, these institutions were especially designed to train young men for the Puritan ministry, because such education could not be obtained in contemporary public schools. The word gradually lost its religious denotation, and by the 19th century was a general term for a secondary school for boys corresponding roughly to the gymnasium (q v) in Germany In colonial America, the term "academy" was introduced by Benjamin Franklin (q v), his proposal resulted in the chartering (1753) of the Academy and Charitable School in the Province of Pennsylvania. In 1755 it was renamed the College, Academy and Charitable School of Philadelphia (now the University of Pennsylvania), with power to grant degrees On the secondary-school level, the earliest academies, Phillips Andover and Phillips Exeter, founded in 1780 and 1781, respectively, introduced a modern curriculum The academies were private, religion-oriented boarding schools As they displaced the colonial Latin grammar schools, so were they largely superseded by the public high school after the American Civil War, those which survive, and other similar institutions, have largely become college-preparatory schools

As a designation for a school, the term "academy" is also used in a looser sense to indicate institutions in which special accomplishments such as horseback riding, fencing, or dancing are taught Another use in this sense is the application of the term to schools which prepare students for a particular profession, in the United States the term is used with this meaning in the titles of the United States Military Academy, the United States Naval Academy, and the United States Air Force Academy (qq v)

As a term meaning a body of learned men (originally the faculty of a school of philosophy), the word "academy" has come to be applied to various associations of scholars, artists, literary men, and scientists, organized for the promotion of general or special intellectual or artistic interests, and not necessarily connected with any distinct school Thus, the Frankish emperor Charlemagne (q v) applied the name in 782 to a group of scholars organized at his court During the Renaissance academies achieved an intellectual prominence rivaling that of the universities, and first displayed their typical modern form, *see* EDUCATION *Humanism and the Renaissance* They characteristically consisted of a group of elected or appointed investigators, generally under royal or state patronage, who encouraged learning, literature, and art by research and publication In the 15th century important academies were organized in Italy, notably at the courts of the Italian rulers Lorenzo and Cosimo de' Medici, *see* MEDICI In Italy, too, one of the earliest academies devoted to science was organized in Naples in 1560, a later academy founded in the same city in 1603 included the Italian scientist Galileo Galilei (q v) among its members Scientific academies such as the Royal Society of London for Improving Natural Knowledge (q.v), founded in London in 1662, have played roles of the highest importance in scientific progress by encouraging investigations and publicizing their results Stimulated by royal patronage and more efficient methods of communication among scholars, the foundation of academies reached its height in Germany and northeastern Europe during the 18th century. In France, the most celebrated of all collections of academies was organized in 1795 as the Institute of France (q v) The institute now contains five distinct academies, all but one of which were founded as independent institutions in the 17th century, among the most notable of these institutions are the French Academy and the academies of science and art

In the U S , academies have not attained the complexity and prestige of their European models because American scholars and scientists have traditionally preferred to organize in learned societies open to all qualified applicants and independent of government support American academies of the European type include the National Academy of Design, the National Academy of Sciences, and the American Academy of Arts and Letters (qq v) The last-named academy, a counterpart of the French Academy, is a subsidiary division of the National Institute of Arts and Letters (*see* Institute of Arts and Letters, National), which is in turn modeled upon the Institute of France S H & W W B

ACADEMY AWARDS. *See* Motion Picture Arts and Sciences, Academy of

ACADIA *or* **ACADIE,** original name of the region in Canada now known as Nova Scotia The region was first colonized by the French, in 1604, but the English claimed the area by right of the discoveries of the Venetian-born explorer John Cabot (q v) in 1497–98 In 1621 a grant to the peninsula was obtained by the Scottish poet and statesman Sir William Alexander (q v) Control of Acadia changed hands several times during the subsequent Anglo-French struggle for supremacy in North America The British obtained permanent possession by the Treaty of Utrecht (1713), which ended the War of the Spanish Succession (*see* Spanish Succession, War of the) The Acadians, who attempted to remain neutral in the Anglo-French conflicts, suffered greatly In 1755, because of renewed war with France, the Seven Years' War (q v), and doubts as to the loyalty of the Acadians, the British colonial authorities removed the Acadians from their lands, dispossessed them of their property, and dispersed them among the other British colonies in America The suffering of the Acadian exiles was recounted in the narrative poem *Evangeline* by the American poet Henry Wadsworth Longfellow (q v)

The design of the Corinthian capital, said to be derived from the acanthus plant, is illustrated by columns supporting the main door of Saint Mark's Cathedral in Venice, Italy UPI

ACADIA NATIONAL PARK, region of natural beauty, in Maine, on the Atlantic Ocean, about 40 miles S E of Bangor The park, largely centered on the granite-cliffed Mount Desert Island, also includes part of Isle au Haut and Schoodic Point Of particular interest to tourists are Thunder Hole, where the ocean makes a thundering roar as it enters a large crevice, Anemone Cave, and Cadillac Mountain, 1532 ft above sea level, and the highest point on the E coast of North America The park is a wildlife sanctuary Acadia National Park, covering 41,642 41 acres, was established in 1919, and is administered by the National Park Service

ACADIE. *See* Acadia

ACANTHUS, in botany, ornamental plants of the Acanthus family (Acanthaceae) characterized by pinnatifid leaves about 1 to 2 ft long and by red, white, or purple flowers in spiny bracts *A spinosus* and *A. mollis,* natives of southern Europe, are the species best known, they have been extensively conventionalized in sculpture and decoration

ACANTHUS, in Greek and Roman architecture, style of decoration reputed to be based upon the acanthus plant The Greeks represented *A spinosus* in metal and stone, but the Romans preferred *A mollis* and represented it exclusively in their decorative stone carvings *A mollis,* however, is said to have inspired the design of the Corinthian capital built by the Greek sculptor Callimachus (fl late 5th cent B C).

ACAPULCO, in full ACAPULCO DE JUÁREZ, town and seaport of Mexico, in Guerrero State, on the Pacific Ocean about 190 miles S W of Mexico City The harbor, about 8 sq mi in area, is almost entirely landlocked The city has scheduled air service and highway connections with the interior of Mexico Cotton, tropical fruits, sugarcane, coffee, tobacco, and sesame seed, the chief products of the surrounding region, are among the principal exports

The tropical climate and scenic beauty of Acapulco make it a popular winter resort for tourists.

Pease-Monkmeyer Press

Endowed with a fine harbor and located in a setting of great natural beauty, Acapulco is sometimes known as the Riviera of Mexico It has luxury hotels, gambling casinos, and excellent beaches and is popular with winter vacationers and deep-sea fishermen The climate is warm, dry, and pleasant between December and April, but hot and humid from May to November The city was founded in 1550 and from 1565 to 1815 was Mexico's major port on the Pacific coast for Spanish trade with the Far East Pop. (1970) 174,378

ACARINA *or* **ACARIDA,** order of arachnids (*see* ARACHNIDA) with the cephalothorax and abdomen united, including the mites and ticks They are found both on land and in water, and are generally parasitic on animals or plants, some causing skin diseases and galls The mouth parts are adapted for sucking or biting The cheese mite, the sugar mite, the itch mite, the common harvest bug, the frequent parasite on the human nose (*Acarus folliculorum*), the water mites or water beetles, and the so-called red spider of hothouses are forms of Acarina

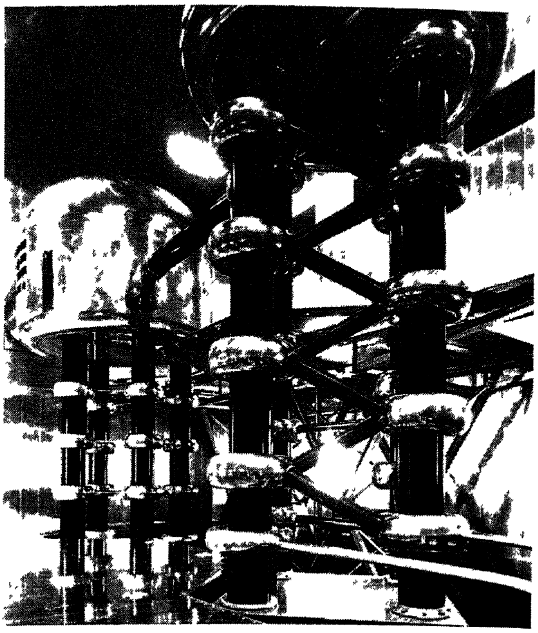
ACARNANIA, mountainous, wooded country in the NW section of ancient Greece, separated from Epirus (q v) on the N by the Ambracian Gulf, from Aetolia (q.v) on the E by the Achelous R , and bounded on the S and W by the outer Corinthian Gulf and the Ionian Sea The Acarnanians supported Athens in the Peloponnesian War (431–404 B C) In 390 B C Acarnania was conquered by the Spartans, and was ruled successively by Sparta, Athens, and Thebes until 338 B C At that time it came under Macedonian control with the victory of Philip II (q v), King of Macedon, at the Battle of Chaeronea After nearly a century under Macedon, Acarnania was partitioned between the states of Aetolia and Epirus, but the Epirote section regained its independence in 230 B C The Acarnanians sided with Philip V (q v) of Macedon in his unsuccessful wars against Rome, they were forced to send hostages to Rome in 167 B C Rome, however, allowed Acarnania to retain its own government until about 22 B C, when Augustus (q v), the first Roman emperor, reorganized the provinces of the empire Some Acarnanians were then transported to the emperor's new city of Nicopolis while the rest remained in the province of Achaea *See* Greece *History*

ACCELERATION, rate at which the velocity of a body increases per unit of time Acceleration is called uniform acceleration if the rate of increase remains the same over successive and equal intervals of time A decrease in velocity is sometimes called negative acceleration, and sometimes deceleration Angular acceleration is the rate at which the velocity of a body increases when it is moving in a curved path The force of gravity (*see* Gravitation) will impart to a body falling freely in a vacuum an acceleration that depends on the distance above sea level The standard value of the acceleration of a freely falling body, in vacuum, at sea level and 45° latitude, is 32 17 ft per second per second

ACCELERATOR, in chemistry, any substance added to a chemical compound to speed up the rate of reaction In photography, an accelerator speeds the action of a developer In structural engineering, an accelerator speeds the setting of concrete, in the rubber industry, an accelerator speeds the vulcanization of rubber In the manufacture of plastics, an accelerator is used to speed up the curing of epoxy and other resin-type plastics

Accelerators are also devices used by physical scientists to impart very high velocities to charged nuclear particles and ions being used as projectiles against atoms and atomic nuclei *See* Accelerators Particle, Nuclear Energy

ACCELERATORS, PARTICLE, in physics, machines used in nuclear research, *see* Accelerator, Atom and Atomic Theory, Nuclear Reactions Nuclear particle accelerators today are some of the largest and most expensive instruments used by physicists Yet each of them has the same three basic parts as the accelerator used by the British scientists John D Cockcroft and Ernest T S Walton (qq v), a source of charged particles or ions (charged nuclei), a tube pumped to a partial vacuum in which the particles can travel freely, and some means of speeding up the particles, *see* Nuclear Energy, Nucleus The key to accelerating particles is that like electrical charges repel each other, whereas unlike charges attract each other By placing electrodes (*see* Electrode) with a large potential difference at each end of an evacuated tube, Cockcroft and Walton were able to accelerate protons to 125,000 to 250,000 volts, *see* Proton

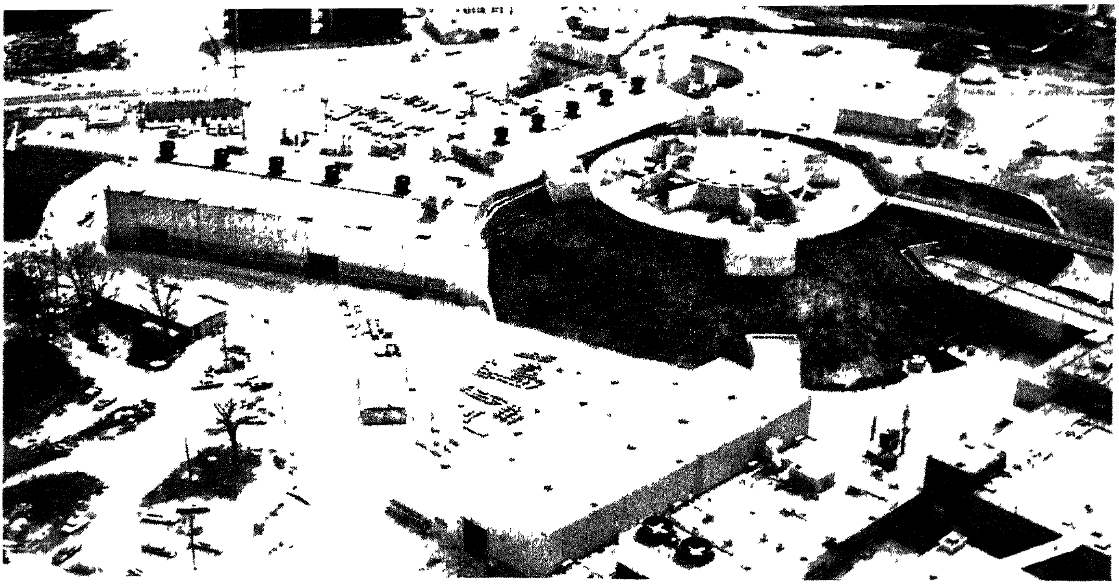


The Cockcroft-Walton generator provides the initial stage of acceleration for protons in a large synchrotron Here hydrogen atoms, stripped of their electrons, are raised to an energy of 750,000 electron volts

Argonne National Laboratory

The Van de Graaff accelerator which was originated in 1931 by the American physicist Robert Jemison Van de Graaff, is similar to various forms of apparatus that have been used for many years in laboratories to obtain discharges of static electricity This machine builds up a tremendous potential between two electrodes by bodily transporting charges on a moving belt Modern Van de Graaff accelerators can achieve energies as high as 15 million electron volts (mev) High-energy physicists use the "electron volt" as a unit of energy This is the energy gained by one electron (q v) in falling across one volt potential difference Because the charge of the proton is as great as the charge of the electron, its energy also is measured in electron volts *See* Van de Graaff Generator

Another machine, first conceived in the late 1920's, is the linear accelerator or linac, which uses alternating voltages of high magnitude to push particles along to a target in many small



Aerial view of the Zero Gradient Proton Synchrotron at Argonne National Laboratory Argonne, Ill

Argonne National Laboratory

steps Particles pass through a line of hollow metal tubes enclosed in an evacuated cylinder An alternating voltage is timed so that a particle is pushed forward each time it goes through a gap between two of the metal tubes It is theoretically possible to build a linac of any energy, depending on the availability of space and money The largest linac in the world, at Stanford University, is 2 mi long It is capable of accelerating electrons to an energy of 20 billion electron volts (bev)

Ernest O Lawrence (q v) of the University of California won the 1939 Nobel Prize in physics for a breakthrough in accelerator design in the early 1930's This was the development of the cyclotron (q v), the first circular accelerator. A cyclotron is somewhat like a linac wrapped up into a tight spiral Instead of many tubes, the machine has only two hollow vacuum tubes shaped like capital letter D's back to back (thus ᗡ D) A magnetic field surrounds the tubes to keep the particles moving in a circle Each time the charged particles pass through the gap between the tubes they are accelerated, they are accelerated twice per revolution As the particles gain energy, they spiral in increasing circles Finally they are shot out of the accelerator into nuclear targets

When nuclear particles in a cyclotron gain an energy of 20 mev or more, they gain appreciably in mass This tends to slow them down and throws the acceleration pulses at the gaps between the tubes out of phase A solution to this problem was suggested in 1945 by the Soviet physicists Vladimir I Veksler (1907–66) and the American physicist Edwin M. McMillan (q v), of the University of California The solution, the synchrocyclotron, is sometimes called the frequency modulated cyclotron In this instrument the oscillator (radio-frequency generator) that accelerates the particles around the D's is tuned, as the particles gain mass, the frequency of accelerations is lowered slightly to keep in step with them As the maximum energy of a synchrocyclotron increases, so must its size increase, for the particles must have bigger and bigger spirals to whirl in The largest synchrocyclotron is the 236-inch "phasotron" at the Dubna Joint Institute for Nuclear Research in the Soviet Union This instrument, which accelerates protons to 680 mev, has magnets weighing 7200 tons

When electrons are accelerated, they undergo a large increase in mass at a relatively low energy At 1 mev energy, an electron weighs two and one half times as much as an electron at rest Synchrocyclotrons cannot be adapted to make allowance for such large increases in masses Therefore, another type of cyclic accelerator, the betatron (q v) is employed to accelerate electrons

The synchrotron is the most recent and most powerful member of the accelerator family A synchrotron resembles a doughnut with a toroidal evacuated particle "racetrack" running between the poles of a ring of magnets The particles are confined to a tight circle and enter the "racetrack" after already being accelerated to several million electron volts Particles are accelerated at one or more points on the magnet ring each time they pass around it To keep the particles in a rigid orbit, the strengths of the magnets in the ring are increased slowly In a few seconds the particles reach energies greater than 1 bev and are ejected, either directly into experiments or into nuclear targets in which what has been termed beams of other fundamental particles are produced for study. The synchrotron principle can be applied to either protons or electrons, although most of the large machines are proton-synchrotrons A 10-bev electron synchrotron was completed in 1967 on the campus of Cornell University, Ithaca, N Y

The first accelerator to exceed the 1-bev mark was the cosmotron, a proton-synchrotron at Brookhaven National Laboratory (q v) The cosmotron was operated at 2 3 bev in 1952 and later increased to 3 bev In the mid-1960's two operating synchrotrons were regularly accelerating protons to energies of about 30 bev These were the Alternating Gradient Synchrotron at Brookhaven and a similar machine near Geneva, Switzerland, operated by the European Center for Nuclear Energy Research (C E.R N) A 12 7-bev synchrotron of different design, constructed to provide the most intense beams of high-energy particles, was in operation at Argonne National Laboratory, Argonne, Ill A 76-bev proton-synchrotron at Serpukhov, near Moscow, in the U S S R , underwent its first full-scale tests in November, 1967

The most powerful proton-synchrotron in the world in the middle 1970's was the Fermi National Accelerator Laboratory (Fermilab) at Batavia, near Chicago, Ill The accelerator complex, named after the Italian-born American and Nobel Prize-winning physicist Enrico Fermi (q v), has a main circular ring that is 4 mi in circumference. Late in 1972, a 400-bev proton beam was passed through the huge accelerator for the first time, and in 1975 physicists at Fermilab predicted that the machine might eventually operate at energies in excess of 1000 bev

The availability of accelerators with a wide variety of capabilities has given the nuclear scientists many kinds of high-speed "bullets" to explore atoms Machines with capacities of millions of electron volts are used to produce and study nuclei, leading to the identification of new elements (*see* ELEMENTS, CHEMICAL) and isotopes (*see* ISOTOPE) and the explanation of phenomena that affect the entire nucleus Machines exceeding 1 bev are employed to study the fundamental particles that compose the nucleus Nearly fifty of these particles have been identified High-energy physicists hope to discover rules or principles that will permit an orderly arrangement of the proportion of subnuclear particles Such an arrangement would be as useful to nuclear science as the periodic law (q.v.) is to chemistry. J T S.

ACCENT, in language, special stress as distinct from pitch on one syllable of a spoken word, which makes that syllable more prominent than the others If stress is placed upon the entire word in a sentence, that word is emphasized, but if one syllable of the word is stressed, that syllable is accented Accent is to words what emphasis is to sentences In dictionaries the accents are indicated by such symbols as ′ to indicate a primary or main stress and ″ to indicate a secondary stress Every English word has one or more stressed syllables Frequently the secondary stress is placed on an early syllable of a word, as in *rec″ om mend′* and *res″ to ra′ tion,* sometimes it falls on the last, as in *down′ pour″* and *drum′ head″*. By changing the accent, many nouns may be made verbs, as *ob′ ject—ob ject′* Stress accent is more complex in the English language than in most of the ancient and modern languages of the world The meters of English poetry are determined entirely by accent, rather than by the quantities of vowels, *see* VERSIFICATION

ACCESSORY, in criminal law, accomplice in the commission of an offense as distinguished from the chief offender An accessory before the fact is one who deliberately instigates others to commit an offense, but who does not himself take a direct part in the offense An accessory after the fact is one who, knowing that an offense has been committed, takes active steps to shelter the offender from justice or to enable him to escape Accessories must be distinguished from principals in the second degree, that is, persons who, although not the actual perpetrators of the crime, were nevertheless present and aided and abetted in the commission of the offense The tendency of modern legislation has been to convert accessories before the fact into principals, and an accessory before the fact is often subject to a punishment as severe as that imposed upon a principal An accessory after the fact, on the other hand, is subject to less severe penalties

ACCESS, RIGHT OF, legal incident of the ownership of property abutting on the sea or other navigable waters, or on a highway or other public lands It is of the nature of a servitude or easement (q v) Access to air as against a neighboring proprietor can be acquired only as an easement The right of access to a highway over the land of another is also of the nature of an easement that will in certain cases, as when such access is necessary for entrance and exit, be presumed to exist

ACCIDENT, unintended and unforeseen event, usually resulting in personal injury or property damage In law the term is usually limited to events not involving negligence (q v), the carelessness or misconduct of a party involved, or a loss caused by lightning, floods, or other natural events, *see* Act of God In popular usage, however, the term "accident" designates an unexpected event, especially if it causes injury or damage without reference to the negligence or fault of an individual The basic causes of such accidents are, in general, unsafe conditions of machinery, equipment, or surroundings and the unsafe actions of persons that are caused by ignorance or neglect of safety principles

Organized efforts for the prevention of accidents began in the 19th century with the adoption of factory-inspection laws, first in Great Britain and then in the United States and other countries, *see* Factories and the Factory System *Factory Inspection* Fire-insurance and accident-insurance companies made efforts to enforce safety rules and to educate the public Factory inspectors and inspectors from fire-insurance and casualty-insurance companies carried on a campaign against unsafe conditions and actions, and at the beginning of the 20th century a new branch of engineering developed, devoted to the finding and elimination of such hazards, *see* Safety Engineering

Laws concerning workmen's compensation (q v) were passed in Germany in 1884, Great Britain in 1897, and the several States of the U S beginning in 1911 By placing on the employer the financial burden of caring for injured workmen, such laws created an incentive for providing safe machinery and working conditions, and for improved selection and training of employees In the U S , the National Safety Council (q v) was formed in 1913, this noncommercial organization has since been a leader in accident-prevention activities, especially in the publication of educational literature, the compilation of statistics, and the coordination of the work of schools, clubs, industrial organizations, and State and municipal agencies

In 1913 the American automobile manufacturer Henry Ford (q v) introduced assembly-line techniques in the manufacture of automobiles, *see* Automobile *History* The subsequent tremendous increase in the number of motor vehicles in use was responsible for a great rise in the motor-vehicle accident rate and offset a decline in the rate of nonmotor-vehicle accidents The peak in the death rate from motor-vehicle accidents was reached in 1937, when it was 30 8 per 100,000 of the population Prior to 1937, as motor-vehicle accident rates were rising, public and private organizations, such as the International Association of Chiefs of Police and the national and local automobile clubs, began a continuing campaign for better education of drivers, stricter enforcement of motor-vehicle and traffic regulations, and improvement of highway engineering By 1961 the campaign had resulted in a reduction of the motor-vehicle death rate to 20 8 per 100,000 The rate rose somewhat subsequently and in 1973 was estimated at 26 6 per 100,000

In the U S in 1973 motor-vehicle accidents were responsible for about 47 percent of the total number of accidental deaths, as compared with about 22 percent for accidents in the home, about 12 percent for work accidents, and about 19 percent for accidents in public places, or public deaths (excluding motor-vehicle but including railroad and airplane accidents) Motor-vehicle accidents were responsible for 55,800 deaths in 1973 Aside from motor-vehicle accidents the greatest single cause of accidental death is falling, which accounts for approximately one fifth of the fatalities

Accidental deaths reached a high of 110,052 in 1936, but the death rate of 85 9 per 100,000 population was not as high as the 1906 rate of 93 2 In 1973 the total was estimated at 117,000, and the rate was estimated at 55 8 per 100,000 population In addition to the cost in lives of accidents, the cost in permanent impairments to individuals in 1973 totaled 420,000, temporary total disabilities reached 11,100,000 The economic costs of accidents in 1973 reached a total of $26,200,000,000 Of this total, wage losses accounted for $13,300,000,000, medical expenses for $5,400,000,000, and insurance administrative costs for $7,500,000,000 More than one half of the total economic costs stemmed from motor vehicle accidents Work-related accidents accounted for about one quarter of such costs, home-related accidents and accidents that occurred in public places each accounted for one eighth.

See also Health Insurance

ACCIDENT INSURANCE. *See* Health Insurance

ACCLIMATIZATION, process whereby animals or plants become adapted to, and thrive in, a climate different from that to which they are indigenous If the difference is extreme, changes take place in the structure and physiology of the organism The reindeer is unable to acclimatize, removed from the cold north to the fertile valleys of a temperate climate, it degenerates and dies On the other hand, the horse, native to Asia, thrives in the United States Ostriches are raised with success in Argentina, but not in California Various Australasian trees, notably the eucalyptus, thrive in California, and successful experiments have also been made with them in the cotton-growing States, the tea plant also grows well in various parts of the U S The introduction of coffee into the West Indies is another example of successful acclimatization Plants or animals may become, by gradual movement to increasingly different climates, inured to a climate completely unlike that to which they are native If they had been suddenly transferred to such a climate, they would have perished On the other hand, each species of plant has certain limits of temperature within which it will succeed, and alleged instances of acclimatizing have merely been instances of unsuspected hardiness in the plant *See also* ADAPTATION

ACCOMPLICE, in criminal law, any person who is in any way associated with another in the commission or attempted commission of a criminal offense An accomplice is punishable either as principal or accessory (q v) Under certain conditions, he is a competent witness either for or against his associates at every stage of the proceedings

ACCORDION, musical instrument of the wind group, with collapsible bellows, a keyboard on the right side, a set of free metal reeds arranged in pairs (*see* REED), and valves controlled by buttons or keys on the left keyboard The accordion is the smallest reed-organ instrument

Two types of accordion are the chromatic and the piano accordion Both are played by contracting and expanding the bellows while pressing the various keys or buttons This action opens the valves and causes a flow of air that makes the reeds vibrate, thus producing musical tones In both types the right hand plays the treble keyboard; the left hand works the bellows, while the fingers of the left hand play the bass keyboard The bass buttons in each type also supply accompanying chords

The chromatic accordion differs from the piano accordion in two ways. First, the treble keyboard of the chromatic accordion is fitted with buttons, that of the piano accordion is a piano keyboard, with a range of from one to three and one-half octaves Secondly, when the bellows of the chromatic accordion is contracted, one of the pair of reeds produces a musical tone, when the bellows is expanded, the second reed sounds a musical tone a semitone higher or lower In the piano accordion each of the pair of reeds sounds the same note.

The chromatic accordion was invented in Berlin, Germany, in 1822 The piano accordion was first made in Italy in 1872 and became popular in the United States about 1908 Of the two types, the piano accordion is the more popular among professional musicians, it is frequently used in dance bands and may also be used as a solo instrument

ACCOUNTANT, one who makes a profession of accountancy, *see* ACCOUNTING An accountant may either be privately employed or engaged in the public practice of accountancy and offer services to business concerns, banks, estates, institutions, or public bodies Accountants who are employees of such organizations are generally required to set up accurate records and efficient systems of accounts, to prepare tax returns and accounting reports such as balance sheets and income statements, and to develop cost reports and other accounting data needed by the organizations Independent public accountants audit, verify, and certify the correctness of the financial statements issued by their clients, and are frequently engaged to prepare complex tax returns for individuals, partnerships, estates, trusts, and corporations A high standard of professional ethics and integrity must be maintained by every accountant Vital information revealed to him in the course of his work for employers or for clients must be held in strict confidence Accountants are obligated to keep informed of new developments in such fields as taxation, governmental regulation of business, finance, law, and economics, as well as in accounting principles and methods

In the United States, a person wishing to carry on a professional accounting practice may obtain a certificate granting him the title of certified public accountant by complying with the requirements of the laws of individual States A summary of the qualifications necessary in New York State is as follows an applicant for a certificate must be over twenty-one years of age and show evidence of good moral character, complete a course in a recognized college of accountancy; have had three years of diversified accounting and auditing experience, and pass professional examinations given by the State in the fields of auditing, practical accounting, the theory of accounting, and commercial law

A British accountant on a professional level roughly corresponding to that of a certified public accountant in the U S is known as a chartered accountant Chartered-accountant certificates are not granted directly by the government but by a quasi-official body, the Institute of Chartered Accountants in England and

Wales, which also gives the professional examinations taken by all applicants

ACCOUNTING, science of organizing, analyzing, and interpreting business records Accounting and bookkeeping (q v) were originally synonymous terms The term bookkeeping is now generally restricted to the keeping of the books, or accounting records, of a business enterprise, accounting, on the other hand, includes the determination of the methods by which such records are to be kept, the analysis of the records themselves, and the drawing of conclusions as to the condition and conduct of the enterprise Accounting demands a wide knowledge of business in general and a special knowledge of the field in question, particularly when complex problems of classification and valuation are involved, as in the assessment of such intangible assets as patents and goodwill (q v), *see Assets,* below Finally, the analyses by an accountant (q v) of the obligations due to owners, creditors, and government agencies require an understanding of the relationship between business and such fields as finance and law

An understanding of the elements of accounting may be conveyed best by detailed descriptions of the two basic types of accounting reports or statements the balance sheet and the income statement, or statement of profit and loss Other technical reports made by an accountant, such as schedules, inventory statements, and special analyses, are usually supplementary to these fundamental statements

The Balance Sheet. A balance sheet is a comprehensive report giving a financial picture of the condition of an enterprise at a given time The point most frequently selected is the last day of the calendar or fiscal year, many corporations, however, prepare semiannual and quarterly balance sheets Some corporations engaged in seasonal businesses adopt a so-called natural business year, ending at the close of a business season The essential fact common to all balance sheets is the identity between the total values of assets, on the one hand, and of obligations, on the other The latter item includes both creditor claims and proprietary interests For example, balanced against the value of a $20,000 house may be a $12,000 mortgage (creditor claim) and an $8000 equity held by the owner (proprietary interest) In most corporate structures, proprietary interests, in the form of capital stock and retained earnings, constitute the capital of a firm. Such capital, frequently called the net worth of the firm, must be distinguished from all forms of liabilities Thus, the basic equation underlying the balance sheet may be more accurately stated as an identity between assets, on the one hand, and liabilities plus net worth, on the other

Print shows bookkeeping methods before modern mechanization Bills were written by hand with quill pens, and all processes were handled individually

Granger Collection

Assets. In the balance sheet, assets are generally divided into three main categories current assets, fixed assets, and intangible assets

The principal items subsumed under current assets are cash on hand, accounts receivable, and the estimated monetary value of goods on hand, or inventory An additional account called prepaid expenses, including such items as rents and fees that have been paid in advance, is also frequently listed In many cases, one or more special funds are placed among current assets, a typical example might be a sinking fund to replace equipment Such a fund is not usually in cash, in most instances it consists of readily negotiable bonds that are, in effect, cash at work earning interest until needed to purchase replacement equipment Until the time that cash in the sinking fund is actually committed to specific purposes, it remains part of the pool of liquid current assets, as distinct from the fixed assets for which an accounting is next made

The items normally listed as fixed assets are estimates of the monetary value of equipment and buildings At this point depreciation presents particularly difficult problems In most modern balance sheets the values of plant and equipment are stated at their cost price less depreciation The accountant first enters the original cost of these items He then subtracts an allowance for depreciation. The difference is entered among the assets as the final value

Among the most important entries under intangible assets are patents (*see* PATENT) and goodwill Ownership of a patent secures for the owner exclusive rights to a production process or invention for a fixed period Such a right clearly has value as an asset, since it affords a company opportunity for exceptional profits during the life of the patent Most patents are originally booked at cost The value placed on a patent in a balance sheet, however, steadily declines as the patent approaches the end of its period of protection In modern accounting, the value assigned to a patent is usually computed through the application of a depreciation formula similar to that used in the case of a fixed asset, such as a truck or machine Most intangible assets of an enterprise are entered under the general category of goodwill, which covers everything, not listed elsewhere, that might contribute to profits for example, the advantages the enterprise enjoys through recognition of its trademark, of its ability to evolve advanced designs, or of its capacity to produce materials or products of lasting quality In general, an enterprise either omits its own goodwill from its balance sheet or assesses it at a nominal value, such as one dollar, even though its profitable operations would apparently warrant a substantial goodwill asset In this way the accountant allows for the uncertainty of future operations and avoids the danger of overinflating the assets account When a company purchases another company, however, an item is usually entered on the balance sheet under goodwill The amount paid for goodwill, that is, for above-normal earning power and enlarged capacity to compete, generally consists of the excess of the price paid over the value of the other assets purchased For example, if a firm expends $500,000 for the purchase of another company, but receives only $100,000 in the form of such assets as inventory, plant and equipment, and patents, the accountant is justified in entering up to $400,000 under goodwill to account for the additional value received

Liabilities and Net Worth. Liabilities are generally differentiated in accounting as either current or long-term liabilities, this division corresponds roughly to that between current and fixed assets. The normal items entered under current liabilities are wages payable, that is, the sums of money due to labor, accounts payable, for example, the amounts owed for goods bought on credit, and notes payable, that is, the amount pledged by promissory notes to individuals, banks, or finance companies In addition, most corporations include among their current liabilities an item called reserve for taxes, an account in which a company accumulates funds for future payments to various government tax authorities Long-term liabilities are obligations that become due more than one year after the balance sheet date, and typically include extended loans, such as those advanced or guaranteed by the Small Business Administration (q v), mortgage loans, and obligations, generally known as bonds payable, incurred through the flotation of bond issues, *see* BOND

The principal items included under net worth, or capital, are issues of preferred and common stock, *see* STOCK Stock shareholders receive dividends from the profits of the enterprise A profitable corporation, however, does not usually distribute all of its net earnings in the form of dividends The undistributed residue is accounted for in the balance sheet and is often entered under capital as retained earnings Thus, undistributed profits are shown as contributing to an increase in net worth In practice, this increase is rarely reflected solely in the cash position of an enterprise, but is invested in generally increased assets, such as a larger inventory or additional fixed or intangible assets, or in decreased liabilities, such as lowered short-term and long-term debts

The Income Statement. Whereas a balance sheet presents a static record of the financial position of an enterprise at a given moment, an income, or profit and loss statement indicates the flow of activities over an extended period as reflected in revenues from sales and all other sources, in costs, and in expenses for the entire period Except for cases of recapitalization, all changes of successive balance sheets are attributable to the operations recorded on the intervening income statements

In its most common form, an income statement begins with an item listing the gross proceeds of sales for the period covered All costs and charges are then subtracted from this item to indicate net earnings or profits The major cost item is usually the manufacturing cost of the goods sold This item includes the costs of materials and labor, miscellaneous operating expenses (consisting essentially of such overhead costs as rent, insurance, and office expenses), and depreciation charges The nature of depreciation and of accounting methods of computing gradual depreciation charges are discussed in a separate article, *see* DEPRECIATION It may be pointed out here, however, that an accountant must be conservative in calculating depreciation charges Because these charges are at best rough estimates and represent only a paper ex-

Man, woman, and machine Electronic computers now "keep the books" for many modern businesses

UNIVAC Public Information

pense, as distinct from such a demonstrable expenditure as labor costs, they can sometimes be inflated to lower apparent profits and thus avoid taxes As a general rule, government taxing agencies permit a corporation to choose any reasonable method of computing depreciation, but insist that the method chosen must be used throughout the life of the equipment

The deduction of such fixed charges as interest on bonds and of corporation income taxes yields net income after taxes From this amount dividends on preferred stock are first deducted to arrive at profits available for distribution to holders of common stock. Part of these profits may have been disbursed as dividends on common stock, and the remainder added to retained earnings, which are also entered on the balance sheet, as stated above

Modern Accounting. The major recent development in accounting technique is the introduction of modern calculating machines to replace less sophisticated mechanical devices and manual calculation and recording, *see* COMPUTER Among the important professional developments fostered by increasingly specialized training is the appearance of such specialists as the tax accountant, specializing in the preparation of tax returns, and the cost accountant, specializing in the detailed analysis of the costs of labor, materials, and overhead expenses Specialization has also appeared in the accounting departments of most large corporations An accounting department is now generally managed by certified public accountants, who prepare accounting statements for the company and assist in the preparation of its financial budget In addition, general bookkeeping and internal auditing, which also fall within the province of the accounting department, are supervised by accountants General charge of the accounting department is usually vested in an officer of the corporation, such as the treasurer or comptroller

Most businesses furnish financial statements, or accounting reports, to banks or suppliers for credit purposes, and to stockholders and prospective investors Independent certified public accountants are generally engaged in such cases to audit the books and records and to certify to the correctness of the financial statements before they are issued

History. Accounting and bookkeeping share common origins The accountant's functions in such enterprises as small, individual, and partnership businesses are still assumed by a bookkeeper In ancient, medieval, and early Renaissance times, bookkeepers called stewards or auditors, who devoted all their time to the service of a single individual or organizaton, performed the duties now assumed by accountants The earliest recorded association of accountants was the *Collegio dei Raxonati,* which was founded in Venice, Italy, in 1581, the members of this group may have been merely public employees rather than independent professional accountants in the modern sense of the term Accountancy as a profession must nevertheless have had a firm foothold in Italy by 1742, for in that year the city of Milan established a scale of legal fees for accountants

In Great Britain, where modern accountancy was first established, records for the year 1790 indicate that only five accountants were carrying on professional practices By 1822 their number had increased to no more than seventy-three At about the middle of the 19th century, however, the growth of large-scale corporate entities, exhibiting the characteristic features of modern joint-stock organization, greatly stimulated the opportunities and the need for trained accountants, *see* CORPORATION The earliest association of professional accountants in Great Britain, the Society of Accountants, was organized in Edinburgh in 1854, later organizations were incorporated in Glasgow, Aberdeen, and London in 1855, 1867, and 1880, respectively The passage of the Bankruptcy Act of 1869, which transferred the administration of insolvent estates from public officials to private hands, also acted as a stimulus to accountancy in Great Britain On the Continent the development of the profession did not keep pace with that in Great Britain, and public regulation of accountants was comparatively lax. Societies for professional accountants were, however, organized in the Netherlands, Sweden, and Belgium in 1895, 1899, and 1903, respectively

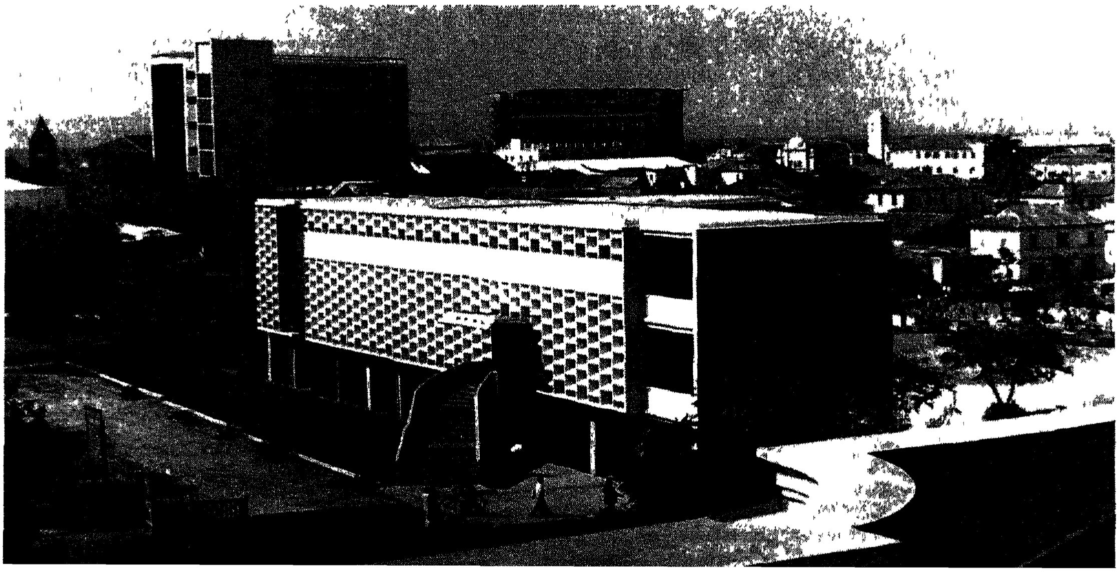
In the United States, higher education for accountancy was instituted in 1881, when the Wharton School of Finance and Economy of the University of Pennsylvania was founded By 1900 similar schools had been established at New York University, Dartmouth College, and the universities of Chicago and Vermont. The most important professional organization of accountants, the American Association of Public Accountants, was founded in 1887, in 1916 its name was changed to the American Institute of Accountants and its membership limited to certified public accountants Governmental regulation of the profession was begun in New York State in 1896, at the present time all States award the title of certified public accountant and enforce standards within their boundaries With the steady increase in the number of public accountants and the establishment by almost all colleges and universities of schools of accounting, the comparatively new profession of accountancy developed more rapidly in the U S than elsewhere There are about 110,000 certified public accountants in the U S

ACCRA, capital, seaport, and largest city of Ghana, on the N coast of the Gulf of Guinea An important commercial center, the city is the terminus of railroads leading inland to Kumasi and beyond, and the site of an international airport Accra has no harbor facilities for oceangoing vessels, and sea freight had to be lightered between docks and ships at anchor in the open roadstead until a modern deep-water port at Tema, a few miles east, was opened to shipping in 1962 Cacao is the chief export Fishing and fish processing are leading industries University College, the chief center of higher education in Ghana, is nearby to the north. A point of interest is the 17th-century Christiansborg Castle, which serves as an official residence.

The Portuguese built a trading post and fort on the site of Accra in 1565 During the 17th century the Dutch, who forced the Portuguese to withdraw, the Danes, and the English founded rival trading posts there In the 19th century Great Britain purchased Dutch and Danish rights in Accra, and in 1876 the city was made capital of the Gold Coast Colony During World War II the city was the West African headquarters of the United States Air Transport Command Accra became the capital of newly constituted Ghana in 1957 Pop. (1970 prelim) 564,194.

The Central Library of Accra is one of many modern buildings recently completed in the national capital

Ghana Information Service



ACELDAMA *or* **AKELDAMA** (Aramaic, *hăgēl dĕmā*, "field of blood"), designation applied in Acts 1 18–19 of the New Testament to the site of the suicide of Judas Iscariot (q v) According to legendary accounts the site, commonly identified with the potter's field of Matthew 27 7, lies a short distance south of ancient Jerusalem According to Matthew 27, the priests of Jerusalem purchased the field as a burial place for strangers It was bought with the thirty pieces of silver that Judas received for betraying Jesus and, in his hour of repentance returned

ACER *and* **ACERACEAE.** *See* MAPLE

ACEROLA. *See* BARBADOS CHERRY

ACETALDEHYDE, volatile, colorless liquid, CH_3CHO, with a pungent odor, b p 20 16° C , m p −123 5° C , and density 0 7780 g per milliliter at 20° C. It is important as an intermediate in the manufacture of many industrial chemicals, pharmaceuticals, and plastics (q v.), including acetic acid (q v), butyl alcohol, chloral, and pyridine It is miscible in all proportions with water and most common organic solvents, and is manufactured by the dehydration of ethyl alcohol, by the hydration of acetylene, or by the oxidation of certain hydrocarbons (qq v) More than 2,000,000,000 lb of acetaldehyde were produced annually in the United States in the late 1960's, about half of which was used in the manufacture of acetic acid *See* CHEMICAL COMPOUNDS, SYNTHETIC

ACETATE. *See* CHEMICAL COMPOUNDS, SYNTHETIC

ACETATE RAYON. *See* RAYON, TEXTILES *Textile Fibers Synthetic Fibers*

ACETIC ACID, common name of ETHANOIC ACID, CH_3COOH, a colorless liquid of sp gr 1 049, b p 245° F (118° C), and m p 62° F (17° C) Pure acetic acid, because it freezes at slightly below ordinary room temperatures, is called glacial acetic acid, mixtures of acetic acid with water solidify at much lower temperatures Acetic acid is miscible in all proportions with water and with many organic solvents It has a sharp, irritating odor and sour taste In aqueous solution it functions as a weak acid

Acetic acid can be prepared by the action of air on solutions of alcohol in the presence of bacteria (*Bacterium aceti*) Dilute solutions (4 to 8 percent) prepared in this way from wine, cider, or malt are called vinegar Concentrated acetic acid is prepared industrially by the destructive distillation of wood It is also produced by a synthetic process, the oxidation of acetaldehyde made from acetylene or alcohol

Acetic acid is used in the production of acetate rayon, plastics, photographic film, paint solvents, and pharmaceuticals such as aspirin (acetylsalicylic acid)

ACETIC ANHYDRIDE, colorless, volatile, mobile liquid, $CH_3CO)_2O$, with an irritating odor, b p 139 6° C , freezing point −73° C , and density 1 082 g per milliliter It is primarily employed as an intermediate in the manufacture of industrial chemicals, pharmaceuticals (*see* PHARMACY), perfumes, plastics (q v), synthetic fibers, explosives, weed killers, and other chemical products, *see* CHEMICAL COMPOUNDS, SYNTHETIC It is manufactured by the dehydration of acetic acid, or by the oxidation of acetaldehyde (qq v) About 1,600,000,000 lb of acetic anhydride were produced annually in the United States in the late 1960's, three-fourths of which was used for the manufacture of cellulose acetate, and about 1 5 percent for the manufacture of aspirin (q.v)

ACETONE, *or* DIMETHYL KETONE, colorless liquid, CH_3COCH_3, the simplest of the organic chemicals called ketones It has a mild, pleasant odor, boils at 56.5° C (133 7° F), and melts at −95° C. (−139° F) Completely soluble in water and organic solvents, acetone is itself an important solvent and is used both in the chemical laboratory and in industry Enormous quantities are used as solvents for cellulose acetate in the production of rayon (q.v) and as a gelatinizing agent for explosives Acetone is also used as an ingredient in lacquer solvent and to dissolve gums and resins It is the solvent in rubber cement and in some cleaning fluids Acetone can be prepared in the laboratory in a variety of ways, such as by oxidation of isopropyl alcohol or by heating of calcium acetate It was formerly obtained industrially by the destructive distillation of wood, but this source supplies only a small fraction of the present demand Most acetone now is obtained by the fermentation of sugar by certain bacteria to yield acetone instead of alcohol and by synthesis from petroleum

ACETOPHENETIDIN. *See* PHENACETIN

ACETYLENE, colorless, odorless, inflammable gas, C_2H_2, slightly lighter than air, with a melting point of −81 8° C (−115 2° F) and a boiling point of −88 5° C (− 127 3° F) As ordinarily prepared it has an unpleasant odor due to impurities Acetylene can be prepared from any of various organic compounds by heating them in the absence of air, but it is usually made commercially by the reaction of calcium carbide with water. Although acetylene can be liquefied at ordinary temperatures with high pressure, it is violently explosive as a liquid It is usually kept in metal tanks, under high pressure, dissolved in liquid acetone (q v) When acetylene is bubbled through an ammoniacal solution of cuprous chloride, copper acetylide, a reddish precipitate, is formed This is used as a test for acetylene Copper acetylide is explosive when dry

When acetylene burns in air a hot and brilliant flame is produced Acetylene was formerly much used as an illuminant and is still so employed for special uses and in cases in which electricity is too expensive Its principal use is in the oxyacetylene torch, where acetylene is burned in oxygen, producing a very hot flame used for welding and cutting metal Acetylene is also used in chemical synthesis, particularly the manufacture of vinyl chloride for plastics, acetaldehyde, and the neoprene type of synthetic rubber

ACETYLSALICYLIC ACID. *See* ASPIRIN

ACHAD HA-AM. *See* GINZBERG, ASCHER

ACHAEAN LEAGUE, confederation of ten or twelve Greek towns established originally by the ancient Achaeans (q v), a Greek-speaking people living on the northern coast of the Pelopónnisos, the peninsula forming the southern part of Greece The original league played little part in the wars of the 5th century B C, but, toward the end of the 4th century B C, it was conquered by the Macedonians (*see* MACEDONIA) By 280 B C, following the death of Alexander III (q v), King of Macedonia, known as the Great, and the subsequent internal strife in Macedonia, the Achaean League was reestablished The confederacy was further strengthened by the addition, between 251 and 229 B C, of the non-Achaean states of Sicyon, Corinth, Megalopólis, and Árgos (*see* GREECE *History Hellenistic Period*) The Achaean League was a federation Each member state or town of the league was autonomous, but all members participated in a council which met biannually to formulate common foreign policy and to enact legislation involving economic matters, such as coinage The leading statesmen of the Achaean League included the generals Aratus of Sicyon (271–13 B C) and Philopoemen of Megalopólis (253–183 B C)

About 235 B C Cleomenes III, King of Sparta (r 235–19 B C), provoked a war with the league in an attempt to force the Achaeans into a Pelopónnisian federation After two serious defeats the Achaeans asked and received help from Macedonia Cleomenes III was finally defeated at Sellasia in 222 B C As the price of aid from the former enemy, Achaea again became subject to Macedonia About 198 B C the Achaeans allied themselves with the Romans against the Macedonians During the next forty years the Romans completely subjugated the league, together with the rest of Greece, taking to Rome in 168 B C one thousand Achaeans as hostages, among them the Greek historian Polybius (q v) In 146 B C Achaea became a Roman province that encompassed all of Greece south of Thessaly and Macedonia G E D

ACHAEANS, people of Achaea, an ancient country in the northern Pelopónnisos, Greece The term was broadly used by the poet Homer (q v) to designate all the inhabitants of ancient Greece, *see* GREECE *History Ancient Greece* In mythology, the Achaeans were descendants of Achaeus, grandson of Hellen, the legendary ancestor of the Hellenes, or Greeks

References to the western kingdom of Ahhiawa in Hittite documents of the 13th and 14th centuries B C have been thought by scholars to refer to the city of Mycenae (q v) under Achaean domination These documents characterize the Achaeans as a maritime nation located in western Asia Minor and on the island of Lesbos in the Aegean Sea, *see* HITTITES· *Hittitology.* In the Homeric period (about 11th cent B C) the Achaeans controlled southeastern Thessaly and most of the Pelopónnisos, but in the period from the 6th to the 4th century B C they were restricted to a narrow strip on the north coast of the Pelopónnisos *See* ACHAEAN LEAGUE

ACHATES, in classical legend, the constant companion of the Trojan hero Aeneas (q v)

ACHERON, in Greek mythology, river in Hades (q v) It was also the name of a river in s Epirus, Greece, which flowed underground for part of the 36-mi course to the Ionian Sea According to the Greek historian Herodotus (q v), an oracle to the dead was on the river

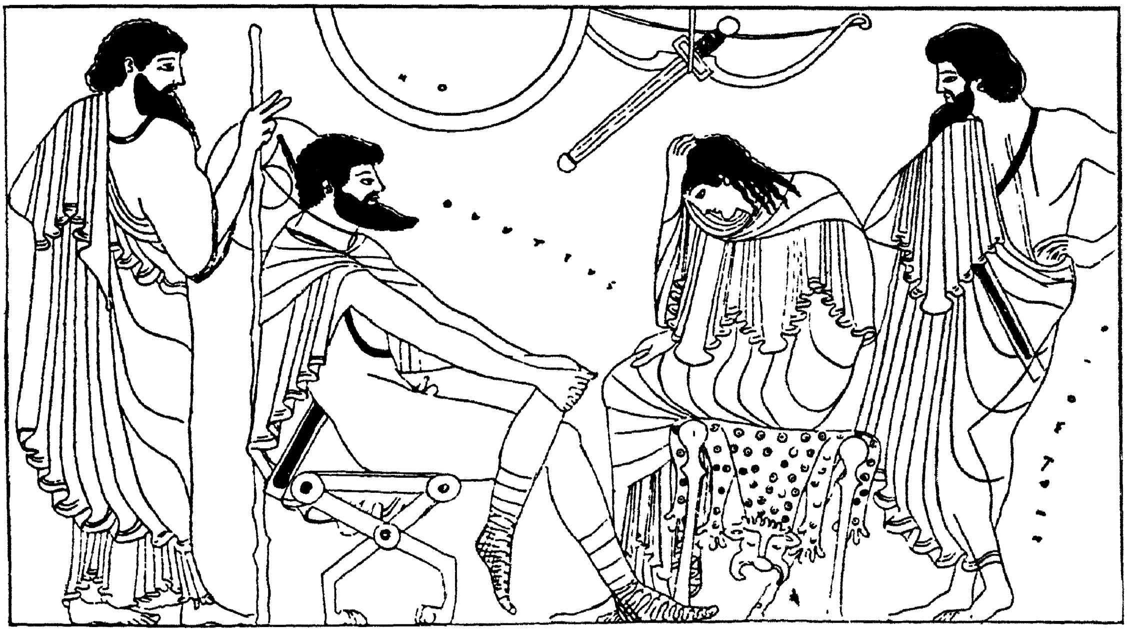
ACHESON, Dean Gooderham (1893–1971), American statesman, born in Middletown, Conn , and educated at Yale University and Harvard Law School From 1919 to 1921 he was private secretary to Associate Justice of the United States Supreme Court Louis Dembitz Brandeis (q v) Subsequently Acheson practiced law In 1933 he served as undersecretary of the treasury He was assistant secretary of state from 1941 to 1945, undersecretary from 1945 to 1947, and secretary of state under President Harry S Truman (q v) from 1949 to 1953 In the last-named post Acheson continued the policies laid down by his predecessor, George Catlett Marshall (q v), most notably in the implementation of the European Recovery Program (q v), and represented the United States in the negotiations leading to the North Atlantic Treaty (*see* NORTH ATLANTIC TREATY ORGANIZATION) In the Truman administration, he played an important role in determining U S policy during the Korean War He was chairman of the San Francisco Conference (1951) at which the World War II peace treaty with Japan was signed In 1961 he was named head of an advisory group on U S policy toward NATO Acheson received the U S Presidential Medal of Freedom in 1964 He wrote *A Democrat Looks at His Party* (1955), *A Citizen Looks at Congress* (1957), *Power and Diplomacy* (1958), *Sketches from Life of Men I Have Known* (1961), *Morning and Noon* (1965), and *Present at the Creation My Years in the State Department* (1969), for which he received the 1970 Pulitzer Prize in history

ACHILLES, in Greek mythology, greatest of the Greek warriors in the Trojan War (q v) He was the son of the sea nymph Thetis and Peleus (qq v), King of the Myrmidons (q v) of Thessaly When he was a child his mother dipped him into the River Styx (q v.) to make him immortal The waters of the river made him invulnerable except for the heel by which his mother held him When the Greeks began to organize the expedition against Troy (q v), Thetis, fearing for his life, sent her son to Scyros, an island in the Aegean Sea, where Achilles lived at the court disguised as a girl The wily Ulysses (q v), King of Ithaca, discovered him, however, and easily persuaded him to go to Troy

Achilles fought many battles during the ten-year seige of Troy When the Mycenaean king Agamemnon (q v) seized the captive maiden Briseis from him, Achilles withdrew the Myrmidons from battle and sulked in his tent The Trojans, emboldened by his absence, attacked the Greeks and drove them into headlong retreat Then Patroclus (q v), Achilles' friend and companion, begged Achilles to lend him his armor and let him lead the Myrmidons into the battle Achilles consented When Patroclus was killed by the Trojan prince Hector (q v) the grief-stricken Achilles returned to battle, slew Hector, and dragged his body in triumph behind his chariot He later permitted Priam (q v), King of Troy, to ransom Hector's body, and then prepared for his own death which the Fates (q v) had decreed would follow soon after the death of Hector. Achilles fought his last battle with Memnon (q v), King of the Ethiopians After killing the king, Achilles led the Greeks to the walls of Troy There he was mortally shot in the heel by Paris (q v)

The quarrel between Achilles and Agamemnon, the subsequent battle, and the ransoming of Hector's body are recounted in the epic poem *Iliad* by Homer (qq v).

ACHILLES TENDON, in the legs of mammals, powerful, cordlike band of connective tissue joining the fused muscles of the calf to the bone of the heel Because muscles move bones by pulling on the connecting tendon, severing or rupturing of the Achilles tendon results in immediate loss of the normal use of the leg and foot The name of the tendon derives from the



Achilles, disguised as a girl, being persuaded by Ulysses (seated opposite him) to join his countrymen in the war against Troy legendary Greek warrior Achilles (q.v.), said to be vulnerable only in one heel.

ACHIN *or* **ACHEEN** (Indonesian, *Atjeh*), former sultanate in the NW portion of the island of Sumatra (q.v.). Originally a dependency of the neighboring state of Pedir, Achin became an independent sultanate during the first quarter of the 16th century. The sultanate was most powerful between 1607 and 1636. Imperialist rivalries among Portugal, Great Britain, and the Netherlands for control of Achin dominated its history during the remainder of the 17th century.

In 1819 the British government acquired exclusive trading privileges with the sultanate. An Anglo-Dutch agreement (1824) made the sultanate a virtual protectorate of the Netherlands. Achinese resistance to Dutch control culminated in armed conflict (1873), which recurred at intervals until the establishment after World War II of the Republic of Indonesia (q.v.). During this period the Dutch succeeded in subjugating only the coastal areas.

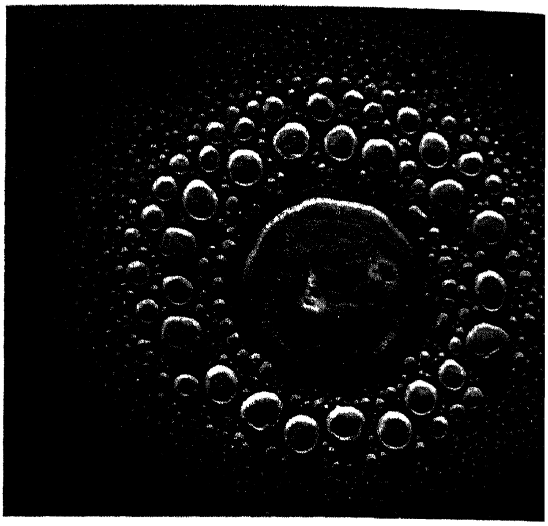
ACHITOPHEL *or* **AHITHOPHEL** (fl. 10th cent. B.C.?), in the Old Testament, friend and adviser to David (q.v.), King of the Jews. According to the Biblical story, he counseled Absalom (q.v.), the son of David, to rebel against his father. After Absalom was killed in battle, Achitophel committed suicide (2 Sam. 16:20–17:23).

ACHROMATISM, in optics (q.v.), property of a lens system of bending a beam of white light in such a way that all of its component colors are brought to a focus at the same point, thus obtaining a sharp image. It is impossible for a single lens to achieve achromatic focus because different wavelengths of light are bent by differing amounts as they pass through the lens (*see* SPECTRUM). It is necessary to combine at least two lenses made of glass having different refractive indexes. The principle was discovered in 1757 by John Dollond (1706–61), a British optician.

ACIDOSIS. *See* BLOOD: *Homeostatic Reactions*.

ACIDS, originally, substances that in solution in water have a sour taste, the intensity of the sourness depending on the strength of the acid. The meaning of the term, however, has grown with the development of chemical theory. Currently the sourness of acids is attributed to hydrogen ions (*see* ION), often written as H_3O^+, that are formed, along with negative ions, when an acid dissolves in water. For example, hydrogen chloride, HCl, when dissolved in water, is almost completely converted into H_3O^+ and Cl^- ions, and it functions as a strong acid. Weak acids are those that are transformed only partially into H_3O^+ and negative ions.

The H_3O^+ ions confer on acid solutions certain other properties. The solutions are electrical conductors (*see* ELECTRO-CHEMISTRY); they accelerate corrosion of active metals such as aluminum, iron, and zinc; they change the color of many materials, for example, they turn blue litmus red; and the stronger acids liberate carbon dioxide from limestone and other metal carbonates.



A study of a droplet of sulfuric acid, 2.5 microns in diameter, reveals a large number of peripheral droplets that appear to indicate the function of acidity. This configuration is consistent for sulfuric acid droplets down to at least 0.01 microns in size.

National Center for Atmospheric Research

The Danish chemist Johannes Nicolaus Bronsted (1879–1947) and the British chemist Thomas Martin Lowry (1874–1936) classified acids as all the substances that supply protons (*see* PROTON), which are identical to H^+ ions, in chemical reactions. Thus hydrogen chloride supplies protons to water molecules, resulting in formation of H_3O^+ ions and Cl^- ions. On this basis sodium bicarbonate, $NaHCO_3$, is an acid because it surrenders protons to caustic alkalies; its solutions are not sour, however, and do not show the other properties ascribed to H_3O^+.

The broadest definition of acids is that of the American chemist Gilbert Newton Lewis (1875–1946), who defined them as species that accept pairs of electrons (*see* ELECTRON) when forming bonds with other substances. Thus protons are acids when they accept electron pairs in joining with water molecules to give H_3O^+ ions. Boron trifluoride, BF_3, acts as an acid, that is, it accepts electron pairs, when it combines with ammonia, NH_3. The advantage of this very general idea of acids is that it groups together a wide variety of reactions that seem otherwise unrelated.

See articles on specific acids, such as ACETIC ACID, HYDROCHLORIC ACID *See also* BASES

ACIREALE, city in Italy, on the island of Sicily, about 50 miles s w of Messina, on the Ionian Sea near the base of Mt Etna Acireale is a resort town, known for sulfur springs and sea bathing Nearby are places associated with the myths of Galatea and Polyphemus (qq v). Pop (1971) 48,544

ACKLINS ISLAND. *See* BAHAMAS

ACKNOWLEDGMENT, in law in the United States, the act of avowing before a proper officer or a court that one has executed a legal instrument, and of obtaining a certificate that admits the instrument as evidence in a legal proceeding without further proof of its genuineness A commissioner of deeds or notary public is the regular officer before whom acknowledgments are made, although judges, clerks of court, mayors of cities, and in some states aldermen and justices of the peace, are authorized to take acknowledgments. In all cases the acknowledgment must be signed by the person in whose presence it is made

ACLINIC LINE, *or* MAGNETIC EQUATOR, imaginary line on the surface of the earth approximately parallel to the geographical equator A magnetic dipping needle shows no declination at this line The location of the line changes slightly each year. *See* TERRESTRIAL MAGNETISM

ACNE, *or* ACNE VULGARIS, eruptive skin disease. It is primarily a disorder of the sebaceous follicles of the skin and appears most often on the face, neck, and back The natural secretion, or sebum, of the follicles accumulates and mixes with dust and dirt The follicle and surrounding tissue become inflamed and blackheads appear. If the follicle opening completely closes, the accumulated sebum forms an inflamed cyst. Acne is primarily a disorder of adolescence and is related to the hormonal changes during this period Treatment includes strict cleanliness, maintenance of good general health, avoidance of rich and oily foods, vaccine or hormone therapy, and treatment with sunlight, ultraviolet radiation, and X rays

ACNE ROSACEA *or* **ROSACEA,** *or* GUTTA ROSACEA, disease in which the capillaries in the cheeks, forehead, and especially the nose, are swollen with blood and the oily glands in the skin become infected, forming pimple-like, pus-filled swellings. It is believed the principal cause is poor digestion resulting from improper diet and, frequently, excessive consumption of alcohol. Other causes include infections of the nasal passages, hormone disturbances, and emotional stress Treatment is removal of the basic cause, with the pimples being treated as for acne (q v)

AÇOKA. *See* ASOKA

ACOLYTES (Gr, "followers"), in the Roman Catholic Church, assistants to the celebrant of the Mass (q v) and other public religious services The office is the highest of the four Minor Orders (*see* ORDERS, HOLY), ranking next below subdeacon. The duties of the acolyte include the lighting and carrying of the candles, the preparation of the wine and water for the sacrament, and making the responses of the liturgy Acolytes are lay altar boys in the Church of England (q v)

ACOMA, American Indian village in New Mexico, on a Pueblo Indian reservation in Valencia County, about 55 miles w of Albuquerque The Indians who inhabit the pueblo live in long, terraced dwellings made of stone and adobe, atop a steep mesa 357 ft. high Some cultivation and grazing is carried on in the plain below the mesa, but the chief occupation of the Acoma is the making of pots and baskets which are then sold to tourists. An old adobe church, the San Esteban Rey Mission, built about 1629, is also situated on the mesa The pueblo was discovered by the Spanish in 1540 but was not conquered until 1629. The Acoma were not completely subdued, however, and made unsuccessful attempts at rebellion in 1680 and again in 1689 Pop about 500 *See* PUEBLO

ACONCAGUA, loftiest peak of the South American mountain chain the Andes (q v) and of the Western Hemisphere, in w Argentina, near the border with Chile. An extinct volcano, it is 22,831 ft high. The first ascent to the summit was made in 1897

ACONITE, common name for perennial herbs of the genus *Aconitum* and for a preparation derived from them that was formerly used in medicine. The genus, with more than 100 species, belongs to the family Buttercup (Ranunculaceae) and is native to temperate regions of the Northern Hemisphere. Several species, including *A. napellus,* a well-known European species, are cultivated as garden plants in the United States The common aconites have fibrous or tuberous roots, mostly erect stems, and palmately divided or cleft leaves The flowers in most species are blue or purple, although some species have yellow or white flowers. The outer, showy parts of the bilaterally symmetrical flower are five in number and the uppermost is formed into a large, downward-opening hood.

Because of this hoodlike characteristic, aconites are commonly called monkshood It is the presence of this hood that immediately distinguishes aconite from larkspur (q v)

Aconites contain highly active alkaloids, especially aconitine, and are poisonous to both man and animal *Aconitum napellus* has long been considered one of the most dangerous plants of Europe When eaten by man in small to moderate amounts, roots produce symptoms of restlessness, salivation, nausea, a weakened and irregular heartbeat, pain in the chest, prostration, and frequently death within hours J M K

ACORN. *See* OAK

ACORN BARNACLE. *See* BARNACLE

ACOSTA, Gabriel (1591–1647?), Portuguese philosopher, born in Oporto He was educated as a Roman Catholic, but at the age of twenty-five he was converted to Judaism and was received into the Jewish congregation at Amsterdam, adopting the name Uriel Acosta. After a period of controversy with his fellow religionists, he was charged by them with atheism and was excommunicated His autobiography *Exemplar Humanae Vitae* ("Ideal of Human Life", 1687) rejects revealed religions and proposes a new religion based on natural law

ACOSTA, José de (1539?–1600), Spanish missionary and writer, born in Medina del Campo He became a Jesuit in 1551 and twenty years later he became a missionary in Peru, serving as provincial of his order from 1576 to 1581 His catechism in the language of the Aymara and Quechua (q v) Indians was the first book printed (1583) in Peru He became rector of the Jesuit college at Salamanca, Spain, in 1598 He is remembered chiefly for his monumental book about the natural history and aboriginal customs of Spanish America, *Historia Natural y Moral de las Indias* (1590, Eng trans , *Natural and Moral History of the Indians,* 1604) translated into most important European languages within fifteen years of publication

ACOUSTICS (Gr *akouein,* "to hear"), term sometimes used for the science of sound in general, but more commonly for the special branch of that science, architectural acoustics, that deals with the construction of rooms, public halls, churches, theaters, and radio, television, and sound-recording studios so as to enhance the hearing of speech or music. For the treatment of acoustics as a branch of the pure science of physics, *see* SOUND.

The acoustics of buildings was an undeveloped aspect of the study of sound until comparatively recent times The Roman architect Marcus Vitruvius Pollio, who flourished during the 1st century B C, made some pertinent observations on the subject, and some astute guesses concerning reverberation and interference The scientific aspects of this subject, however, were first thoroughly treated by the American physicist Joseph Henry (q v) in 1856, and more fully developed by the American physicist Wallace Clement Ware Sabine (1868–1919) in 1900

Problems of Design. Acoustical design must take into consideration that in addition to physiological peculiarities of the ear (q v), hearing is complicated by psychological peculiarities For example, sounds that are unfamiliar seem unnatural. Sound produced in an ordinary room is somewhat modified by reverberations due to reflections from walls and furniture, for this reason, a broadcasting studio should have a normal degree of reverberation to insure natural reproduction of sound For best acoustic qualities, rooms are designed to produce sufficient reflections for naturalness, without introducing excessive reverberation at any frequency, without echoing certain frequencies unnaturally, and without producing undesirable interference effects or distortion. *See also* AUDITION

A criterion of the overall reflective qualities of a room is its so-called reverberation time An appreciable reverberation time improves the acoustical effect, especially for music, a loud sound should still be barely audible for one to two seconds after the source of sound has stopped in an auditorium, in a room in a private home a shorter but still discernible reverberation time is desirable The optimum reverberation time for best acoustics varies with the volume of the room, and also depends on whether the room is used primarily for purposes of speech or for music.

Materials. For modifying the reverberations, the architect has two types of materials, sound-absorbent and sound-reflecting, at his disposal for coating the surfaces of ceilings, walls, and floors. Soft materials such as cork and felt absorb most of the sound that strikes them, although they may reflect some of the low-frequency sounds. Hard materials such as stone and metals reflect most of the sound that strikes them The acoustics of a large auditorium may be very different when it is full than the acoustics when it is empty, empty seats frequently reflect sound, whereas an audience absorbs sound.

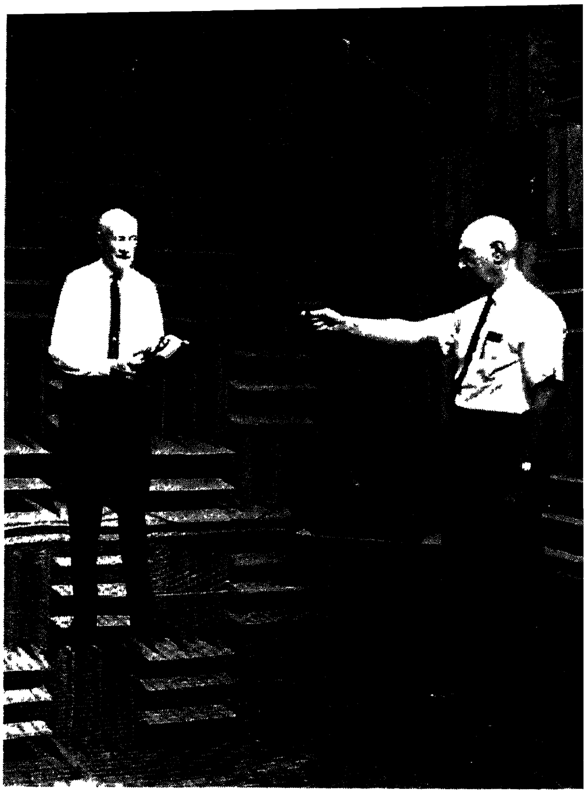
In most cases the acoustics of a room will be satisfactory if a proper balance between sound-absorbing and sound-reflecting materials is created Troublesome echoes may occur as a general rule in a room that otherwise has a proper overall reverberation time if the ceiling or a wall is concave in shape and is highly reflecting, in such cases, sound may be focused at a particular point, making the acoustics bad at that point in the room Similarly, a narrow corridor between parallel reflecting walls may trap sound by repeated reflection and cause troublesome echoes, even though the overall absorption is sufficient Similar problems are encountered in the design of the shell-shaped sounding boards of outdoor structures such as band stands In addition to control of echoes and reverberation, attention must also be given to the elimination of interference. Such interference arises from difference in the distances traversed by the direct and the reflected sound, and produces so-called dead spots, in which certain ranges of frequency are canceled out. Reproduction of sound picked up by microphones also requires the elimination of echoes and interference

Insulation. Another important aspect of room acoustics is insulation from unwanted sounds, as in apartment houses, broadcast studios, or research facilities. Good insulation is obtained by carefully sealing even the smallest openings that can leak sound, by using massive walls, and by building several unconnected walls separated by dead spaces *See* INSULATION

To evaluate the acoustical properties of rooms and materials, the acoustical scientist uses tools such as anechoic chambers and sound-level meters The development of the anechoic chamber, which is a room free from echoes and reverberations, in which all sound is absorbed by glass-fiber wedges placed on the surfaces of the walls, has enabled scientists to learn more about hearing and about sound materials. A good anechoic chamber is so quiet that it is possible to hear the blood circulating in one's own head

A sound-level meter measures sound pressure or intensity which is related to the loudness of a sound, and expresses the result in decibels, a logarithmic unit In a quiet residence the sound-level meter would read about 38 decibels. An ordinary conversation would increase the reading to 70 decibels. The sound intensity of an air-raid siren could reach about 150 decibels, a jet-airplane noise, around 120 decibels When sound intensity is doubled, its level increases by about three decibels. Loudness levels, which are somewhat subjective in that they depend upon the judgment of the listener, are measured in units called sones and phons.

See also HIGH FIDELITY, RADIO *Radio Receivers,* SOUND RECORDING M.C



In acoustics research, University of California physicist Dr Vern O Knudsen measures the noise level of a shot, which will be fired by his assistant, L P Delsasso, in a room specially constructed of baffles

Wide World

ACQUITTAL, in criminal law, judicial discharge of the accused Acquittal automatically follows a determination by a judge or jury that the defendant is not guilty of the charge on which he was tried After the accused has been acquitted he may not lawfully be prosecuted a second time for the same act Such a prosecution would place the accused in double jeopardy of losing his life, liberty, or property in violation of common law and of the United States and State constitutions The protection against double jeopardy normally extends to any prosecution whatever based on the same acts Thus, if the accused has been acquitted on a charge of using a weapon to commit murder he may not thereafter be tried for having committed an assault on his alleged victim If a trial is terminated because of procedural defect, however, the defendant is not protected by the rule against double jeopardy and may be prosecuted again on the same or a related charge

ACRE, seaport of Israel, on the Bay of Acre, about 10 miles N E of Haifa It is one of the oldest communities extant Founded before 1500 B C, it first appears in recorded history during the reign (1501–1447 B C) of the pharaoh Thutmose III (*see under* THUTMOSE) The town was captured by the Assyrians in 701 B C In 332 B C it was incorporated into the empire of Alexander III (q v), King of Macedonia, known as the Great Ptolemy I, King of Egypt (*see under* PTOLEMY), seized Acre in 323 B C, and from that time until the Middle Ages the town was known as Ptolemais During the pre-Christian era, Acre was an important trading center and was successively a part of Syria and a colony of Rome

After the permanent division of the Roman Empire in 395 A D, Acre came under the control of the Byzantine Empire The Arabs seized it in 638 and held it until its capture by Christians in 1104, shortly after the First Crusade, *see under* CRUSADES Saladin (q v), Sultan of Egypt and Syria, recaptured Acre in 1187, but the town was subsequently recovered by the Christians during the Third Crusade. The victors renamed it Saint Jean d'Acre, and awarded it to the Knights of Saint John (*see* SAINT JOHN OF JERUSALEM, KNIGHTS OF). In 1291 after a long siege Acre fell to the Saracens Selim I, Sultan of Turkey (1467–1520) took possession of it in 1517, and Acre remained under Turkish rule for most of the next four centuries In 1918 it was captured by British troops, and was subsequently included in Palestine, a British mandate The town was taken by the Israeli army in 1948 during the war between Israel and the Arab League Acre was incorporated into the independent State of Israel in 1949 and is now the center of the Israeli steel industry Pop (1970) 33,900

ACROBATICS, art or practice of gymnastic stunts by a performer demonstrating great muscular strength and coordination, agility, balance, and speed Acrobatics includes such spectacular activities as walking on a tightrope, swinging from a trapeze, performing on a trampoline, and tumbling *See also* GYMNASTICS

ACROMEGALY, chronic disease marked by overgrowth of hands, feet, and lower part of the face, resulting from excessive production of somatotropin, the growth-stimulating hormone; *see* HORMONES In many cases, over-secretion of the hormone can be traced to a tumor of the pituitary gland (q.v.). In addition to enlargement of certain bony structures of the body, the soft tissues such as the liver and spleen may exhibit abnormal growth Acromegaly is accompanied by progressive weakness, sometimes by diabetes mellitus (q v) and occurs sometimes during lactation The disease usually occurs in the third decade of life and frequently affects more than one member of a family. Treatment consists of injections of sex hormones, X rays directed toward the pituitary gland, and, in extreme cases, surgery A similar disorder, gigantism (q v), occurs in children, producing overgrowth of the long bones of the body A deficiency in production of the growth hormone results in a condition known as dwarfism, which is marked by abnormally short bone development, *see* DWARF

ACRONYM. *See* ABBREVIATION

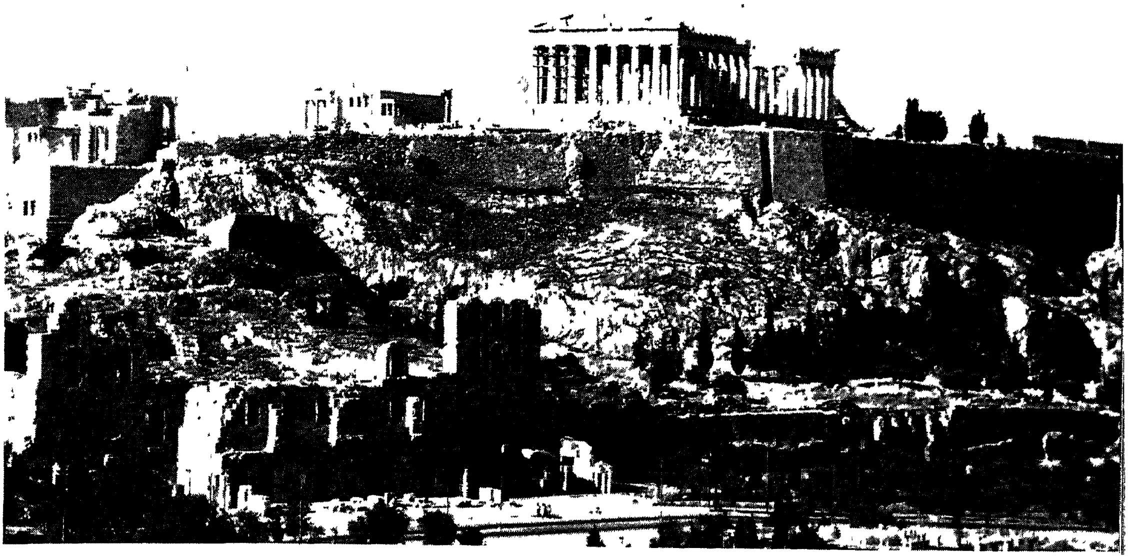
ACROPOLIS (Gr *akros,* "highest", *polis,* "city"), in Greek antiquity, name originally applied to any fortified natural stronghold or citadel Primarily a place of refuge, the typical acropolis was constructed on a hill or eminence rising precipitously from the surrounding region Because of the protection thus afforded, the area adjacent to the base of the hill frequently became the site of a city Many of the cities of ancient Greece developed in this fashion, and their acropolises, including the Acrocorinth at Corinth (q v), the Cadmea at Thebes, and the Larissa at Árgos, are among the most celebrated structures of antiquity

Lower defense walls were erected in certain cities, with the result that the acropolises, no longer useful as military bastions, were utilized for other purposes, notably as sites for temples and public buildings The citadel of ancient Athens is traditionally referred to as "the Acropolis" Built on a limestone hill about 500 ft high, it dominates the city and houses the remains of some of the finest extant examples of classical architecture Included are remains of the Parthenon (q.v), a Doric temple that is considered a model of architectural excellence, the Propylaea, a monumental marble gateway on the west and the principal entrance to the Acropolis, the Erechtheum (q v), a temple famous for perfect detail, and the temple of Athena Nike. These masterpieces were built in the Golden Age of Athens during the reign of Pericles (q v) Damaged and neglected in later times, some of the buildings were gradually restored after the Greek monarchy was established in 1833 *See* GREEK ART AND ARCHITECTURE *The Classical Period Middle Classical Period*

ACROSTIC (from Gr. *akros,* "pointed, first", *stichos,* "a row"), group of phrases, words, or most often, verses, the first letters of which when taken consecutively form a word or phrase or other predetermined entity If a series of final or internal letters forms an additional such entity, it is termed a double acrostic

The English poet Sir John Davies (q v) composed twenty-six acrostic *Hymns to Astrea,* the initial letters of the lines of each hymn forming the words "Elizabeth Regina" in honor of Elizabeth I (q v), Queen of England.

One of the most ancient and well-known



The ruins of the Acropolis in Athens bear witness to the glory of ancient Greece Trans World Airlines

acrostics is the Greek phrase meaning "Jesus Christ, the Son of God, the Savior", the initial letters of which form the Greek word *ichthys*, "a fish"

In the ancient acrostic poetry of the Hebrews, of which Psalms 25 and 34 are examples, the initial letters of the lines or the stanzas spell out the Hebrew alphabet, in order Such verses are known as "alphabetical" or "abecedarian" acrostics

The acrostic was combined with the crossword puzzle (q v) to form the modern double-crostic

ACRYLIC, chemical name for the atomic grouping $CH_2{=}CHCO-$, which occurs in acrylic acid, $CH_2{=}CHCOOH$, and the esters of this acid, called acrylates, such as methyl acrylate, $CH_2{-}CHCOOCH_3$. Acrylic resins, often known as acrylics, are made by the polymerization of acrylate esters or other monomers containing the acrylic group *See* Chemical Compounds, Synthetic *Plastics and Elastomers*

ACRYLONITRILE, colorless, volatile liquid, $CH_2{=}CHCN$, with a pungent odor, b p 77 5° C , freezing point −83 5° C and density 0 806 g per milliliter at 20° C It is made by the addition of hydrogen cyanide, HCN, to ethylene oxide, $(CH_2)_2O$, or to acetylene, C_2H_2, and is employed as a monomer in the production of polyacrylonitrile, *see* Chemical Compounds, Synthetic *Plastics and Elastomers* About 500,000,000 lb of acrylonitrile were produced in the United States annually in the late 1960's, all of which was used for the manufacture of resins (q v) and fibers, *see* Fiber *Synthetic Fibers*

ACTA, public acts or orders of a magistrate in ancient Rome The Romans also applied the term to certain public records The Acta Diurna, called also Acta Populi, Acta Urbana, or Acta Publica, were a daily record of the municipal, political, and social events in Rome These records were displayed in public places for a period of time, and then preserved as historical material Some historians believe that they were introduced by the Roman statesman Gaius Julius Caesar (q v) in 59 B C , but others claim that they existed long before that date The Acta Senatus, or Commentarii Senatus, were a record of the official transactions of the Roman senate and included the opinions of the chief speakers and the final decision of the senate These were regularly published after 59 B C as part of the Acta Diurna The material for the various Acta were gathered by reporters called actuarii *See* Rome, History of

ACTAEON, in Greek mythology, a Theban hunter One day he beheld the goddess Artemis (q v) bathing in a stream. To prevent him from boasting that he had seen her naked, the chaste Artemis turned Actaeon into a stag He was hunted down and torn to pieces by a pack of fifty of his own hounds

ACTH, abbreviation for ADRENOCORTICOTROPHIC HORMONE, hormone secreted by the anterior lobe of the pituitary gland. The specific funtion of ACTH is to stimulate the growth and secretions of the cortex of the adrenal gland One of these secretions is cortisone (q v), a hormone involved in carbohydrate and protein metabolism and in alleviation of the symptoms of allergies and arthritis ACTH, also known as corticotropin, is a complex protein molecule containing thirty-nine amino acids; its molecular weight is approximately 5000 The biological activity of the ACTH of various animal species is similar to that of man, but the sequence of amino acids has been found to vary somewhat among species

ACTING, art or practice or profession of representing a character other than oneself in the presence of an audience, as in a theatrical, motion-picture, television, or radio presentation The actor may accomplish his representation of a character by means of suggestive movement and speech and altered physical appearance, together with the aid of such theatrical appurtenances as costumes, scenic effects, and properties, he may also be capable of achieving the desired effect without recourse to any artificial aids, by means of a thorough emotional identification with the character

What is today a highly complicated art, requiring years of training, has its roots in the simple role-playing games of children as well as in the more sophisticated rituals common to all primitive societies A prehistoric man, reenacting a successful hunt for his tribe as they gathered around a communal fire, was, no doubt, the first actor In one typical tribal ritual, Australian aborigines before the hunt don masks and costumes of skin to impersonate hunters tracking an animal The correlation between rites of worship and the playing of roles is characteristic of early cultures. Perhaps as early as 4000 B.C., for example, Egyptian priests acted out legends of Osiris and other gods in their religious ceremonies

The Classical Tradition. The first professional actors were those of the ancient Greek theater The sophisticated theater of Greece in the 5th century B.C. developed from primitive religious rites honoring the god Dionysus, in which a chorus sang hymns relating the story of the god and other mythological heroes Most authorities agree that it was the poet Thespis, in the middle of the 6th century B.C., who introduced the first actor into these celebrations. At first this single actor spoke to the chorus and impersonated characters in the legends In the 5th century B.C. the Greek tragic poet Aeschylus added a second actor, making dialogue and conflict possible Later Greek dramatists, including Sophocles and Euripides, employed a third actor.

Our knowledge of acting in the tragic theater of ancient Greece is derived from contemporary accounts, from painting and sculpture, from the extant manuscripts of three authors (Aeschylus, Sophocles, and Euripides), and from the ruins of the theaters themselves. A great deal of what has been written about Greek acting is therefore conjectural It is known that the tragic actor wore a padded costume, a large mask, a huge headdress, and high-soled shoes The ritualistic, formal nature of the tragedies required slow and dignified movement from the actors if not from the chorus The voice of the Greek actor had to project, clearly and with considerable emotional range, the complicated metric dialogue and verse forms of the tragedies The masks worn depicted the primary emotion of a character, such as sorrow or joy, and also permitted actors to play more than one part Because their work had religious associations, actors, always men, were highly respected Granted a form of diplomatic immunity, they were often employed in diplomatic missions between Greek states Greek acting had many parallels with the realistic acting style of the mid-20th century, since both were concerned with characterization and with the projection of emotion

The acting in Greek comedy of the 4th century B.C. was less strictly formalized than tragic acting The old-style comedies of Aristophanes, many of which are extant, and the new-style comedies of Menander, only fragments of which remain, were performed in a flamboyant, slapstick style Actors depicted gods, heroes, and everyday people all in the same vein of caricature *See* DRAMA *Greek Drama,* GREEK LITERATURE

The drama of ancient Rome copied but did not improve upon the Greek models Actors became increasingly concerned with rhetoric and surface brilliance and less concerned with lyricism and true emotion Roman comic playwrights, such as Plautus and Terence, added some local color to their adaptations of the comedies of Menander An important development was the disappearance of the chorus from the Roman drama. Roman actors, many of them slaves, were not held in high esteem socially, but some of the more successful performers became wealthy Among these was Quintus Roscius (d 62 B.C.), the most famous actor of the classical period By 150 A.D. Roman theater had degenerated into circus-like spectacles and pantomimes, in which acrobatics were more important than acting. In the 6th century A.D. the performances had become so brutal and bawdy that the Christian Church took action against them, forbidding attendance as well as denying the rite of communion to the performers Deprived of the opportunity to practice their profession, actors for several centuries were reduced to wandering mountebanks, jugglers, and acrobats.

Miracle, Mystery, and Morality Plays. The Church itself stimulated the rebirth of drama in the 10th century From that century comes the earliest extant record of a Mass in which what could be called a playlet had been inserted A four-line dialogue in verse, called a trope, was

A relief sculpture from the ancient city of Pompeii, Italy, shows a scene from a Roman comedy, with three of the actors wearing exaggerated comic masks Bettmann Archive

added to an Easter Mass depicting the scene of the angel and the three Marys at the tomb of Christ The four characters were enacted by clerics Later the playlets were extended to include more clerics describing other incidents from the Bible By the beginning of the 13th century the process of secularization was well under way, and the plays were banned from the churches When the transition was made from clergy to laity among the performers and from Latin to the vernacular in the language of the playlets, the plays came to be known as mystery plays By the 14th and 15th centuries these mystery plays had become an accepted part of life. Miracle Plays, depicting the lives of saints and martyrs not derived from the Bible, were also performed. The acting in all these performances was of necessity stark, direct, and primitive Enthusiastic caricature and horseplay were common in both the miracle and mystery plays, as performed by the amateur actors of the towns Usually presented on movable platforms or wagons in the town marketplace, each episode of the plays was assigned to a different guild (q v) of artisans, such as the shoemakers or the stonemasons Later, allegories called morality plays, appeared and were performed on a fixed stage, depicting the conflict between good and evil, with actors personifying such abstractions as obedience, virtue, or gluttony. At the end of the Middle Ages, the line between religious and secular drama had become difficult to establish, as had the line between amateur and professional actor *See* MIRACLE PLAY, MORALITY PLAY, MYSTERY PLAY

New Techniques in the Renaissance. Plays that were copies of Greek and Roman tragedies were performed at the various Italian courts of the Renaissance (q v) in refined and formal style, here the physical theater began to resemble the picture-frame theater in which most actors of today perform But at the same time a different kind of acting was seen in the public squares, this was the commedia dell'arte (q v) Professionalism for actors was firmly reestablished with the commedia, as organized troupes of actors, including women for the first time, played familiar stock characters such as Harlequin, Columbine, and Pantaloon Freely and spontaneously improvising their own scenes and dialogue based on suggested plots posted backstage before each performance, these actors took over the function of the playwright By eliminating the author, encouraging improvisation, and presenting professional actors formed into troupes, the commedia revolutionized acting, drama, and the theater

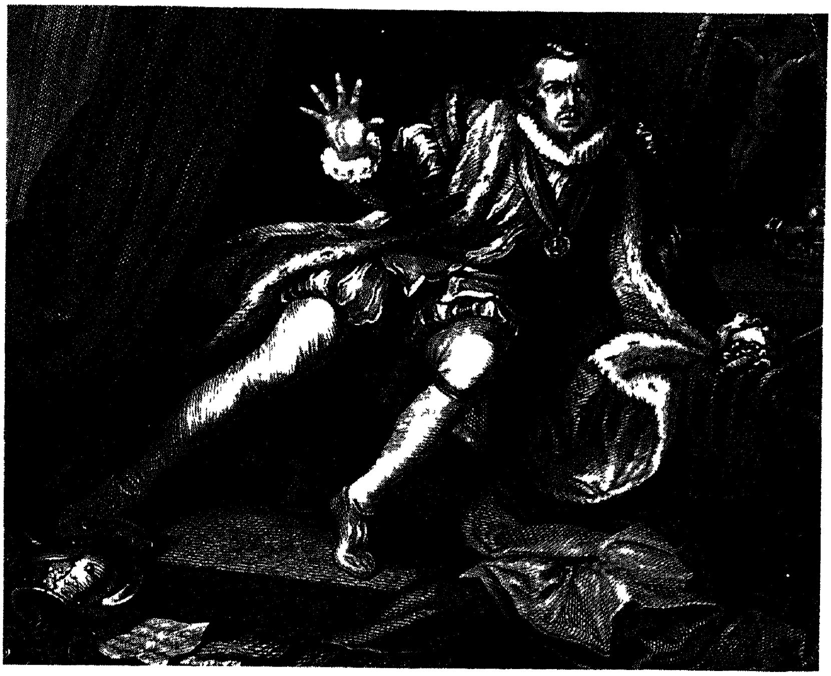
Developments in the Elizabethan Theater. In Elizabethan England acting and the writing of plays flourished in the salutary climate of a court and populace both of which encouraged the drama Actors and playwrights held permanent jobs and shares in their stage company, which was under the protection of a nobleman The plays in which the actors appeared were written in a formal, flamboyant, rhetorical style, and the acting style matched that of the writing But William Shakespeare and his company, first called the Lord Chamberlain's Men and later the King's Men, bitterly criticized and eventually overcame this bombastic style both in writing and in performing. In Shakespeare's tragedy *Hamlet* (1600–01), the title character criticizes players of the time who "strutted and bellowed" and suggests the purpose of acting is "to hold the mirror up to nature" Elizabethan playwrights often doubled as actors Shakespeare himself acted such small roles as the ghost in *Hamlet* Among outstanding Elizabethan actors were Will Kemp (fl about 1600), who played comic roles, and Richard Burbage, leading man of Shakespeare's company and a great tragic actor Many theatrical conventions persisted in spite of the reforms instituted by Shakespeare· young boys acted women's roles, contemporary wigs and costumes were worn regardless of the period of the play being enacted, a minimum of scenery was used and dialogue had to describe the locale It was these Elizabethans, together with the actors and authors of the concurrent golden age of Spanish drama, who paved the way for the more lifelike drama of the future See SPANISH LITERATURE. *Renaissance and Golden Age*

Neoclassic Styles. The neoclassic period in art, music, and literature in England and on the Continent, with its slavish devotion to the pompous recreation of classic modes without classic inspiration, had its influence upon the stage Writers of serious drama, such as the English John Dryden and the French Jean Baptiste Racine, strictly adhered to what they considered the rules of Greek tragedy, requiring that the action of each play take place in a single location and within a few hours' time Their plays required acting that was also strict and formal The speaking of the verse, the gestures, and the movement were artificial and entirely presentational, directed to the audience rather than to the other actors In England, women began to appear on the professional stage for the first time, as the lively roofless playhouses of the Elizabethan era became formal indoor enclosures with painted scenery and artificial lighting

The Contributions of Molière. Between 1658 and 1673 the great French playwright Molière established comedy alongside tragedy as a theatrical art in France. After touring the provinces in farces similar to the Italian *commedia dell'arte,* Molière transformed the stock *commedia* caricatures into the skillfully delineated comic characters of his own satiric plays. An example is his *L'Avare* ("The Miser", 1668), in which Molière himself enacted the leading role of Harpagon, this play was based on the comedy *Aulularia* ("The Pot of Gold", 200? BC) by the Roman playwright Plautus. The acting in French comedy was far less formal than tragic acting, more closely related to the improvised Italian performances from which it was derived Remnants of the style can still be seen in performances of the Comédie Française (q v.), the troupe founded by Molière himself

Era of the Great Actor. The 18th-century stage in England, in revolt against the narrow scope of neoclassicism and the artificial brilliance of the Restoration (q v), tended toward the sentimental and florid, with vocal pyrotechnics and exaggerated gesture But it was the actor, at the expense of the playwright, who attracted the audience Classic plays were rewritten to suit the particular whim of each leading actor, new plays were written with a particular actor in mind In the first half of the century, while the movements and gestures of the actors harked back to the high-flown style of the early Elizabethans, the speech of the actors became either a declamatory monotone or a carefully orchestrated artificial melody Then the British actor David Garrick, who had made his debut in 1741, brought a new performing style to the English stage He attempted to simplify gesture and movement and to make theatrical speech conform somewhat more closely to everyday speech Garrick, inspired by his teacher Charles Macklin (1697?–1797), assembled a brilliant and intelligent company in his theater in Drury Lane The 18th century also brought forth a great wealth of literature dealing with the art of acting, most often presenting formulas for the delineation of passion by means of vocal inflection, gesture, and stance In France, too, great actors such as Michel Baron (1653–1729), Adrienne Lecouvreur (1692–1730), Marie Françoise Dumesnil (1711–1803), and Françis Joseph Talma (1763–1826) performed with passion and were subjected to critical dissection In Italy the *commedia dell'arte* was taken over by and suffered from the dominance of playwrights who attempted to force the improvisational into a literary mold; the playwrights, in turn, suffered from the dominance of the actors for whom they wrote In America, the first significant professional theatrical company, under the management of Lewis Hallam (1712–58), opened in Williamsburg, Va , in 1752. The Hallam company introduced the English acting tradition to the colonies as it toured from the Carolinas to New England.

Romantic Tradition. The revolt against the strictures of neoclassicism culminated in Romanticism (q.v). In the theater, this movement reached the various countries of Europe at different times, from the late 18th century until deep into the 19th century In France, the poet, novelist, and playwright Victor Hugo emphasized the right of the playwright to deal with any subject he might choose and to dispense



David Garrick, the first actor to bring a more lifelike performing style to the British stage, in an 18th-century interpretation of Shakespeare's Richard III For a modern version of the same role, see the illustration on the following page
Bettmann Archive

with the arbitrary neoclassic rules restricting time, place, and action As the author found new freedom, so did the actor The result was an increasingly flamboyant, unrestrained, broadly elocutionary style. This style was indulged in by actors and applauded by audiences well into the 20th century

Era of the Star. The theater prospered and expanded in the late 19th and early 20th centuries At the same time it was dominated by colorful, influential, and highly paid performers who were called stars Individual actors became box-office attractions, drawing audiences by reason of their talent, their fame, or their glamor. In the United States, interest in the theater was whetted by visiting British stars such as Edmund Kean, Charles Kemble, Fanny Kemble (*see under* KEAN, KEMBLE), and William Charles Macready Stars toured from coast to coast, finding appreciative audiences on the westward-moving frontier The growth of cities in the East provided further stimulus to the theater and large audiences At the same time, American actors emerged, many of whom developed into great stars Among these were Edwin Forrest, the first great native-born actor in America, Charlotte Cushman, the first great American actress; Edwin Booth, whose restraint and good taste in acting Shakespearean roles represented a new acting technique, and Joseph Jefferson, who gained stardom in comedy roles

Throughout the Western world, the social and financial status of the actor was improving Actors were fully respected citizens, often wealthy and socially prominent In 1895 the British actor Henry Irving received the first knighthood ever conferred upon a member of his profession

The tradition of the virtuoso performer was carried on not only by American favorites such as Minnie Maddern Fiske and Maud Adams but also by foreign-born great ladies of the theater such as the French Sara Bernhardt and the Italian Eleanora Duse International headliners triumphantly toured Europe and the U S, performing in their native languages These actors brought their virtuosity to classic dramas from world literature as well as to the increasingly sensational melodramas popular throughout the period In these plays theatrical effects, stage machinery, and pathos and sentimentality were more important than logic or verisimilitude

Realistic Tradition. As opposed to the star system, which stressed one individual·actor at the expense of all the other actors and of the play, there began a movement in Germany, under the sponsorship of George II, Duke of Saxe-Meiningen (1826–1914), that emphasized the equal importance of every member actor in the troupe Demonstrating a remarkably strong ensemble technique, his troupe toured thirty-eight cities between 1874 and 1890 It was seen and applauded by André Antoine, the French director who founded the Théâtre Libre in Paris in 1887 There he emulated the ensemble efforts of the Saxe-Meiningen players in his own productions of the new realistic plays written by the Scandinavian authors Henrik Ibsen and August Strindberg In a parallel development, acting styles became more naturalistic and playwrights began to write of everyday people in everyday situations

Of considerable importance and influence after 1900 was the work of the Swiss director and producer Adolphe Appia (1862–1928) and the British set designer and producer Edward Gordon Craig, who tried to achieve a uniformly artistic standard of excellence in every element of theatrical production In their productions the work of the designer and the director was as important as that of the actor and playwright

A further contribution toward realism and away from artificiality and bombast was made by the Moscow Art Theatre The director, Konstantin Stanislavski, schooled his actors in a revolutionary approach to acting, he believed that an actor could truthfully portray an emotion only by recreating that emotion through the memory of a similar moment in his own experience The results of this method can still be seen in performances of the Moscow Art Theatre, in Moscow and on their infrequent tours, especially in plays written by the Russian author Anton Chekhov When the company first toured the U S, in the 1922–23 season, they found American actors already moving away from the artificial acting so popular in the turn-of-the-century melodrama toward a truthful style American drama of the period, written by such authors as George Edward Kelly (1887–1974), Eugene Gladstone O'Neill, and Sidney Coe Howard, was also striving toward truthfulness.

In the 1930's, the Group Theater of New York City carried realistic acting, especially in the plays of Clifford Odets, even farther toward everyday, lifelike behavior Since the 1940's, most important modern drama in America and abroad has been performed in a style derived from that of the Moscow Art and Group theatres Called neorealism, this style invokes a truth to life that is selective and heightened rather than a photographic copy of life itself in all its detail This truth-to-life tenet is the foundation upon which most actors build their performances today, regardless of the type of theater or drama in which they may be performing

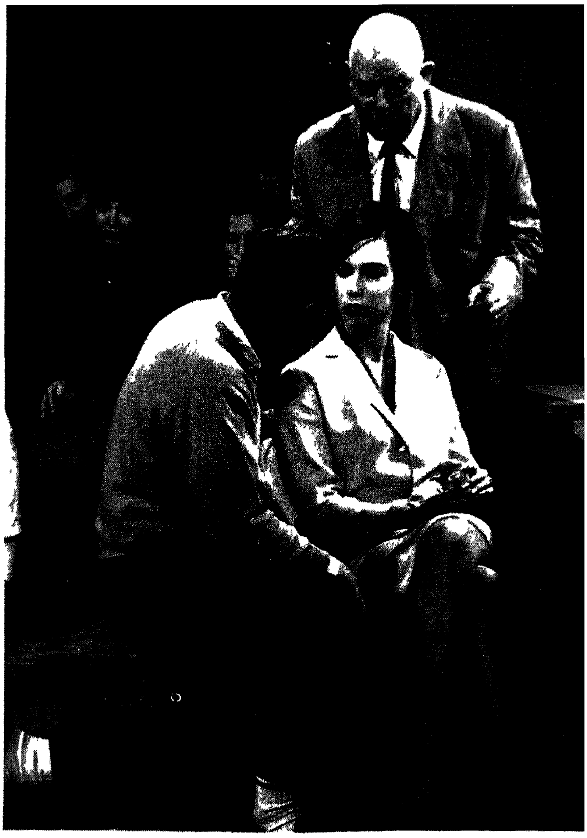
New Media and Techniques. The advent of motion pictures, radio, and television (qq v) significantly affected acting styles Many actors from the stage appeared in these new entertainment media, but new performing techniques had to be developed The actor, brought much closer to the audience through the lens and the microphone, had to adjust his performance accordingly In addition, the performance of a motion-picture or television actor is largely shaped by the work of the director, the cameraman, and the editor, much of which is accomplished after the actor has completed his own work.

Since the late 19th century, when directing for the theater became a distinct profession, the director has gained more and more power over the actor. One result is the continuous increase in the use of individuals who are not professional actors but who bring an undeniable sense of reality to the roles they perform under the guidance of a competent director These untrained nonprofessionals have frequently been selected to appear in motion-picture and television films, in both major and supporting roles. This technique was introduced into the theater with the production of *The Concept* in New York City in 1968, in which residents of a rehabilitation center for drug addicts performed scenes relative to their own experience

The Craft of the Actor. Acting in the 20th century is an enormously complex craft, in-

Sir Laurence Olivier, considered by many critics the finest contemporary actor, plays the title role in his film version of Richard III *by William Shakespeare Olivier's realistic costume and makeup contrast sharply with the appearance of David Garrick in the same role on the preceding page.* Janus Films fluenced by a multitude of forces and traditions For example, the Group Theatre, active in the 1930's in New York City, was strongly influenced by the writings of Konstantin Stanislavski, as is the Actors' Studio of New York City today Under the direction of the American director and former Group Theatre member Lee Strasberg, professional actors who are members of the Actors' Studio perfect their craft through procedures stressing psychological motivation, individual interpretation, and emotional identification with the character being studied These principles had also been adopted by the French director Michel Saint-Denis (1897–1971), who was active in establishing the training programs of the school of the Old Vic Theatre (q.v), London, and the drama division of The Juilliard School (q v), New York City, in addition to the National Theatre School of Canada, Montréal Saint-Denis was one of the many teachers who advocate improvisation but also demand that students be thoroughly grounded in the basic techniques of acting These teachers stress that the basic tools of the actor, his body and his voice, must be rigorously disciplined. The student of acting must also learn how to continue the classic traditions of acting, to adopt a style appropriate to, but not imitative of, the period in which a play was written; in other words, the actor must be versatile enough to perform convincingly the plays of Aeschylus, Racine, Shakespeare, and Ibsen as well as the works of contemporary playwrights Such training can be obtained at professional acting schools, as, for instance, the American Academy of Dramatic Arts (q v) in New York City and the Royal Academy of Dramatic Arts in London; acting schools attached to theaters, such as The American Shakespeare Theater Academy at Stratford, Conn , and the drama or theater departments of many universities Also, many successful actors and directors have taught acting to classes and individuals Among these instructors are the Russian-born Michael Chekhov (1891–1955), the French mime Étienne Decroux (1898–), the Polish Jerzy Grotowski 1933-), the American director Robert Lewis (1909-), and the American actresses Stella Adler (1902-) and Uta Hagen (1919-)

The Actor and the Stage. The actor's performance is often largely dictated by the kind of stage on which he works Contemporary arena staging, in which the audience surrounds the performers in whole or in part, calls for techniques different from those of the conventional picture-frame stage in which the actor does not have such close contact with the audience Another trend in contemporary staging, originated in France about 1950, usually referred to as the theater of the absurd, is characterized by its rejection of conventional dialogue and plot Costumes, stage properties, and decor are used merely to convey a mood rather than to represent a real situation or location The actors, speaking lines meant to depict the meaninglessness and confusion of human existence, do not portray real people but merely expound the philosophical attitudes of the author



Jean Renoir (standing), noted writer and director, teaches a class in advanced motion-picture direction at the University of California at Los Angeles Recent years have produced an increasing awareness of the important interrelation of direction and acting NBC-TV

Another contemporary theatrical style combines elements of arena staging, the absurdist theater, and the epic theater techniques (such as direct social comment and didactic songs and slogans) developed by the German dramatist Bertolt Brecht and the German director Erwin Piscator (1893–1966) This conglomerate style is often referred to as ritual theater Such groups as the Open Theater of New York City and the Living Theater, founded in New York City, but later based in Europe, hope by this kind of ritualism to achieve emotional effects similar to those achieved at the Dionysiac festivals of ancient Greece Members of the company indulge in dance, chanting and improvised dialogue; at-

S.V. Central Library

tempting to achieve complete freedom of mind and body Frequently the members of the audience become participants in the action The action of these performances is usually only suggested by an outline (as in the traditional 16th-century Italian *commedia dell'arte*) and rarely fully scripted These performances often try to achieve what is called total theater, employing film, projected slides, recorded music and sounds, and anything else the company feels will assist them in creating the desired theatrical and emotional effect. For this kind of performance an actor needs great bodily discipline and freedom from conventional mental and moral attitudes

Opportunities for the Actor. In Europe, theaters are often subsidized by national or local governments In England and Ireland, as well as on the Continent, many repertory theaters, such as the Abbey Theater (q v) of Dublin and the Comédie Française of Paris, the oldest national theater in the world, are well established Government subsidy has long been sought by the American theatrical establishment as an urgent need So has decentralization of the theater, although New York City remains the center of American theatrical activity During the 1920's and 1930's the little-theater movement burgeoned across America, providing experience and training on a local level The Cleveland, Pittsburgh, and Pasadena playhouses resulted from this movement More recently, regional theaters have been aided by the American National Theater and Academy (q.v.) and by grants from philanthropic foundations, from local and State governments, and from the National Endowment for the Arts of the National Foundation of the Arts and Humanities (q v.) of the Federal government Since the early 1960's professional repertory companies have flourished in Minneapolis, Seattle, San Francisco, New Haven, and many other American cities.

Oriental Traditions. A great wealth of theatrical tradition exists apart from the Western theater discussed above. Although Western traditions are observed in a majority of theatrical productions throughout the world, cultures such as the Japanese, Chinese, Indian, and Indonesian have, in addition, ancient theatrical forms combining dance, pantomime, and song. These traditional performances are held in appropriate theaters throughout the Orient.

Less realistic than Western, Oriental acting is characterized by symbolic gesture, abstraction, and formality. For more than 2000 years the classic Indian theater has presented plays telling legends of Hindu gods and heroes and acted with fitting dignity. Gestures have symbolic meaning one set of movements of hands and feet means the actor is climbing a mountain, another that he is mounting his chariot, *see* SANSKRIT LITERATURE The same is true of the Chinese theater, in which the actor walks in a circle to indicate a change of locale and the color of the mask he wears signifies his character (white for wickedness, red for honesty), *see* CHINESE LITERATURE The Nō actors of Japan also wear masks and their movement is also highly stylized and symbolic Although the Kabuki actors of Japan perform in a stylized and symbolic manner, they do not wear masks, their faces are painted vividly to portray character; *see* JAPANESE DRAMA The ancient theatrical traditions of Southeast Asia, still extant throughout Indonesia, are primarily dance forms

See also DRAMA, THEATER See separate articles on persons whose birth and death dates are not given

ACTINIDE SERIES. *See* PERIODIC LAW

ACTINISM (Gr *aktis,* "ray"), term coined about 1824 by the British astronomer Sir John Frederick William Herschel (q.v.) to describe the heating power of sunlight. The term now is applied to the property possessed by certain wavelengths of light, called actinic rays, of producing chemical changes. Actinic rays range in the color spectrum from green to ultraviolet Actinism operates to chemically change photographic film, and certain pollutants in the air are chemically converted by actinic rays, producing noxious fumes. The actinic rays of the sun are responsible for the tanning of the skin.

ACTINIUM, radioactive element, with at no. 89, at.wt. 227, b.p. probably over 3000° C (5432° F.), m p probably about 1100° C. (2012° F), sp.gr 10g/ml, and symbol Ac. It was discovered in 1899 by the French chemist André Louis Debierne (1874–1949) The element is found in all uranium ores to the extent of 2 parts to every 10,000,000,000 parts of uranium. Two naturally occurring isotopes of actinium are known Actinium-227 is a member of the actinium series resulting from the radioactive decay of uranium-235; *see* RADIOACTIVITY It has a half-life (q.v.) of 21 7 years. The other naturally occurring isotope, actinium-228, is a member of the thorium series resulting from the decay of thorium-232. This isotope, known also as mesothorium-2, has a half-life of 6.13 years. No practical use is made of either isotope

ACTINIUM K. *See* FRANCIUM.

ACTINOMYCOSIS, *or* LUMPY JAW, *or* BIG JAW, infectious disease of horses, cattle, swine, and, in rare cases, humans The disease is caused by any of several species of the fungus *Actinomyces* (*see* FUNGI MEDICAL FUNGI) The disease is caused in man by *A hominis* and in animals by *A bovis* The fungus invades decayed teeth, diseased tonsils, and the soft tissues of the mouth It is characterized chiefly by abscessed, swollen, and lumpy tissues of the jaw The lungs and intestinal tract may also become infected In humans, the disease is usually acquired by handling or chewing straw used by infected animals Actinomycosis is treated by X-ray therapy, draining the abscessed tissues, and administering sulfonamides and antibiotics

ACTION, in law in England and the United States, any civil proceeding in a court of justice Formerly, in England, the term was applied solely to proceedings in the courts of common law In New York and a few other States the term is applied also to criminal proceedings, it is not applied to such matters as the probate or the interpretation of a will. In the action is embraced every step of the judicial procedure from the service of the summons to the final judgment, but not the means subsequently taken for enforcing such judgment

ACTIUM, town of ancient Greece, on the promontory of Actium, on the s shore of the entrance to the Ambracian Gulf The promontory was the site of an ancient temple to the Greek god Apollo (q v) It was enlarged by Augustus (q v), Emperor of Rome The ruins of the town are extant

ACTIUM, BATTLE OF, in Roman history, decisive naval battle fought off the promontory of Actium (q v) on Sept 2, 31 B C, between the Roman fleet of Octavius, later first Emperor of Rome as Augustus (q v), under the command of Marcus Vipsanius Agrippa (q v.), and a combined Roman-Egyptian fleet commanded by Marcus Antonius and Cleopatra (qq v) The battle was the culmination of the rivalry between Antonius and Octavius for control of the Roman world and had been preceded by a long period of skirmishing, which included large armies encamped on opposite shores of the Ambracian Gulf Against the advice of his generals and reputedly at the behest of Cleopatra, who wanted an opportunity to withdraw to Egypt, Antonius launched the initial phase of the engagement His fleet of approximately 220 heavy craft equipped with missile-throwing devices attacked at close range. Octavius' fleet of about 260 light vessels had greater maneuverability The outcome of the battle remained in doubt until Cleopatra, apparently alarmed by an enemy maneuver, ordered the Egyptian contingent, about sixty vessels, to withdraw Antonius attempted to follow, but most of his remaining vessels were shortly overtaken and annihilated The deserted army subsequently surrendered to Octavius.

ACTIVATED-SLUDGE PROCESS. *See* SEWAGE DISPOSAL· *Sewage Treatment, Biological Treatment*

ACTIVATION, in chemistry, the treatment of a substance in such a way that its action or reactivity is thereby improved Charcoal, for example, may be activated by heating it to a high temperature Activated charcoal is used to adsorb toxic gases, remove impurities from sugar solutions, and remove unwanted odors or colors. Silica gel, a colloidal form of silica (*see* SILICON), and activated alumina, prepared by heating alumina hydrates, are useful as catalysts (*see* CATALYSIS) and dehydrating agents

An enzyme (q.v) may be activated by crystallization in order to make a reaction more effective For example, in medicine, crystallized digestive enzymes are used to increase the waning digestive powers of certain patients

ACT OF GOD, in law, any occurrence not caused by human intervention or negligence (q.v), such as lightning and floods. In that such events are beyond human control, ordinarily no person may be held legally responsible for the injuries and losses which they may inflict For example, a failure to deliver goods at the time contracted because unforeseeable floods have halted all transportation does not result in liability for legal damages In this context, the exemption may not apply in the event of seasonal inundations such as monsoons Most policies of insurance against property damage do not provide compensation for the consequences of acts of God. All standard fire-insurance policies, however, do cover losses from fire caused by lightning; by the payment of an additional premium, so-called extended coverage is available for damage from such hazards as windstorms, hail, ice, snow, and falling trees An act of God is sometimes also called by the equivalent French term *force majeure* or the Latin term *vis major.*

ACT OF UNION, name of four statutes enacted during the history of Great Britain that accomplished the joining of England with Wales (1536), England with Scotland (1707), Great Britain with Ireland (1800), and the provinces of Upper and Lower Canada (1840) in North America

Act of Union of 1536. The Act of Union passed in 1536 formally united England and Wales Signed by King Henry VIII (q v), the second English monarch to be descended from the old Welsh house of Tudor, the act ended centuries of Welsh rebellion against the English Crown By its terms Wales was partitioned into counties, each of which was given representation in the English Parliament Welshmen were guaranteed equality under the English system of laws, and English was fixed as the official language of Wales *See also* WALES *History.*

Act of Union of 1707. The Act of Union passed by the British Parliament in 1707 united the two kingdoms of England and Scotland into the Kingdom of Great Britain The act provided for Scottish representation in the British Parliament in London sixteen from among their ranks were named by the Scottish peerage to sit in the House of Lords, and forty-five representatives were elected by the people to the House of Commons The ancient Scottish Parliament was thus abolished The Scottish legal, or court, system, however, was retained, as was the Presbyterian form of Church government In addition the Scots received equal trading rights with England and her overseas empire

The act was passed during the reign (1702–14) of Queen Anne (q v), the last British sovereign from the Scottish house of Stuart In 1701 the Act of Settlement had determined that, upon Anne's death without children, the Crown would pass to the German house of Hannover, *see* SETTLEMENT, ACT OF Discontent with the 1701 act flourished in Scotland, where the Jacobites (q v) threatened to enthrone an exiled Stuart The Act of Union was passed to abort this movement and insure the acceptance of the British sovereign

Act of Union of 1800. The Act of Union passed in 1800 joined the Kingdom of Great Britain and the entire island of Ireland into the United Kingdom of Great Britain and Ireland The merger followed a fierce but unsuccessful rebellion against British rule in Ireland. The Irish legislature was abolished, and the Irish were allowed thirty-two members in the British House of Lords and one hundred members in the House of Commons. The act also provided for the continuation of the Anglican Church as the established Church in Ireland

See also GREAT BRITAIN *William Pitt, the Younger;* IRELAND *The Period of English Supremacy*

Act of Union of 1840. The Act of Union passed in 1840 by the British Parliament, reunited the North American provinces of Upper and Lower Canada The two provinces had been set up in 1791 in a legislative move precipitated by a predominance of British colonists in one area and a Roman Catholic, French-speaking majority in the other The Act of Union provided for their reunion under a single government headed by a royally appointed governor The new government included a legislative assembly, in which representation was equally apportioned between the former divisions The union formed the Province of Canada, and the two sections were known as Canada East and Canada West

ACTON, 1st Baron. *See* DALBERG-ACTON.

ACTORS AND ARTISTES OF AMERICA, ASSOCIATED. *See* ACTORS' EQUITY ASSOCIATION

ACTORS' EQUITY ASSOCIATION, known popularly as EQUITY, American labor union of actors, actresses, singers, and dancers of the professional theater It is affiliated with the Associated Actors and Artistes of America, a component of the American Federation of Labor and Congress of Industrial Organizations (q v)

The objectives of Equity are the protection of the interests of its members through the establishment of standard conditions of employment in standard contracts for each kind of work carried out by them as performers, and promotion of the welfare of the theater as a cultural and recreational institution The governing power of Equity resides in its council, a board comprising seventy-two persons who are elected by the membership and serve without remuneration The essential condition for membership in Equity is a contract of employment with a theatrical producer. In 1969 the total membership of Equity was about 16,500. The organization maintains headquarters in New York City

History. Equity was founded in May, 1913, in New York City, by a group of leading actors. The aim of the organization was to protect the rights of actors in their contractual arrangements with theater producers and managers. In order to strengthen its bargaining position, Equity became an affiliate of the American Federation of Labor on July 8, 1919, through an international union chartered to represent all theatrical performers, the Associated Actors and Artistes of America. The 4 A's, as this A.F L component is popularly known, issued the charters of nine, since formed into eight, performer unions in all, and continues to represent these unions as unions, rather than the members of the constituent unions individually

Three weeks after its affiliation with the A F.L., Equity became involved in a strike against the Producing Managers' Association for recognition as the representative of the actors The strike, which originated in New York City and spread to eight other cities, closed thirty-seven productions and prevented the opening of eight others The walkout lasted thirty days and resulted in a victory for Equity During the strike, a union of singers and dancers of the professional theater was organized under the name Chorus Equity, the union was affiliated with Actors' Equity until 1955, when the two organizations merged

Originally, the jurisdiction of Equity included all actors in the U S entertainment field except those appearing in foreign-language productions and in vaudeville As motion pictures and radio became important media of entertainment, the Equity members in these fields formed their own unions, the Screen Actors Guild (1935) and the American Federation of Radio Artists (1937), the latter in 1952 became the American Federation of Television and Radio Artists The Associated Actors and Artistes of America represents not only those unions already mentioned, but the American Guild of Variety Artists, the American Guild of Musical Artists, the Hebrew Actors Union, the Italian Actors Union, and the Screen Extras Guild, as well

ACTS OF THE APOSTLES, book of the New Testament (*see* Bible), in the King James Version, The Acts of the Apostles It is traditionally ascribed to Saint Luke (q v), the author of the Gospel of Luke (*see* Luke, Gospel According to Saint) and is generally regarded as a sequel to that Gospel, although it now appears as a separate book The date of composition of the book is a subject of considerable controversy and conjecture Some scholars have placed it anywhere from 60 to 125 A D , but most recent scholarship places the date at some time before 80 A D

Acts is the fullest account of the Apostolic period of Christianity and therefore a valuable source both for archeologists and for historians of religion It recounts the establishment of the Christian Church from the Ascension (q v) of Jesus Christ (q v) to the imprisonment and removal to Rome of Saint Paul (q v) The first part of the book tells of the missionary work that Saint Peter (q v) and the other Apostles, inspired by the Holy Spirit (*see* Holy Ghost), conducted among the Jews in Jerusalem and Judea (qq v) It also tells of the martyrdom of Saint Stephen (q v) and of the conversion of Paul The second part (Acts 13–28.31) is mainly an account of Paul's missionary efforts among the Gentiles in Asia Minor and Greece *See* Christian Church, History of the

ACTUARY, person who applies the theories of probability and statistics (qq v) and the principles of finance (q v) to problems of insurance, pensions, population studies, and related fields Mortality tables and probability tables dealing with death, accidents, sickness, fires, and industrial losses as well as natural disasters are determined by an actuary On the basis of these tables the rates for the various types of insurance are determined, and the various underwriting practices, such as the amount of money reserve that is required to settle expected claims, are established The basic assumption in actuarial science is that the frequency with which events occurred in the past may be used to predict or measure the probability of their occurring in the future, *see* Insurance

In addition to serving in the insurance field, actuaries are widely employed in various government agencies that deal with regulating the insurance industry and in connection with operating the social-security, medicare, and pension programs The relatively new field of operations research employs a large number of actuaries The recent development of high-speed electronic computers and data processing machinery has created many new applications of actuarial science

ACUPUNCTURE, ancient Chinese medical procedure involving the insertion and manipulation of metal needles of various lengths at more than 360 points in the human body Acupuncture is applied to produce local anesthesia during surgery (q v), or to relieve pain and internal congestion in rheumatic and other physiological disorders, *see* Anesthesia, Physiology, Rheumatic Fever The procedure is widely used today in most hospitals in the People's Republic of China and by some private practitioners in Japan

History. Although the technique is generally acknowledged to date back to at least 1500 B C , the history of acupuncture is not well documented The procedure was based on the ancient Chinese theory which held that "vital energy" flowed along a number of invisible meridians in the human body and any interruption or changes in the flow caused various ailments The insertion and twirling of needles, also called needling, was thought to restore the flow and thus the health of the patient

Treatment. Acupuncture needles, now made of steel, are inserted at specific acupuncture points some distance away from the part to be treated, and are used basically to treat various physiological problems, such as appendicitis, arthritis, asthma, epilepsy, or migraine (qq v), or to relieve postoperative pain Nonphysiological problems, such as bone fractures and cataracts, cannot be treated by this method.

Using acupuncture, complex brain, heart, and abdominal surgery is successfully carried out today in China, with the patient fully awake and showing no signs of pain or shock The mechanism by which the insertion of needles acts to inhibit pain is a subject of controversy Earlier opinion that the phenomenon works by having merely a psychological or autosuggestive effect has been disproved by both Chinese and Western scientists who successfully produced anesthetic effects in animals by means of acupuncture After the discovery in 1975 of enkephalins and endorphins, natural pain inhibitors in the body, a number of neurophysiologists suggested that twirling of acupuncture needles or electrical stimulation through them may trigger the release of one or more of these substances, which act to inhibit pain signals by blocking their pathway through the spinal cord (*see* CELL, NERVOUS SYSTEM).

Acupuncture produces hour-long anesthesia after 20 to 30 minutes of stimulation Its effect can be reversed by naloxone, an antiopiate

ADA, city in Oklahoma, and county seat of Pontotoc Co, about 100 miles S E of Oklahoma City Products manufactured or processed in Ada include cement, glass, concrete, bricks, clothing, beef, pork, dairy foods, poultry, cotton, grains, peanuts, and corn The city is the site of East Central State College Ada was incorporated as a city in 1910 Pop (1960) 14,347, (1970) 14,859

ADAIR, James (1709?–83?), American trader and writer, born in Ireland He lived for almost forty years among the Indians, chiefly the Chickasaw (q v), in the region now comprising the southeastern United States His book *The History of the American Indians* (1775), although it insists on the Jewish origin of the Indian race, is one of the best firsthand accounts of the habits and character of the Indian tribes of the region The work contains an incomplete but valuable vocabulary of various Indian dialects.

ADALBERT, Saint *or* **ADELBERT, Saint** (955?–97), Bohemian churchman, the son of a Bohemian noble He became bishop of Prague in 983. Unpopular with the Bohemians because he attempted to convert them to Christianity, he withdrew to Rome, but returned to Prague at the request of Pope John XV (*see under* JOHN) He became a missionary in northern Germany and Poland and, during the course of his missionary activities, was murdered by a pagan priest He is known as the "Apostle of the Prussians", his feast is April 23

ADAM, Adolphe Charles (1803–56), French composer, born in Paris Although originally interested in a scientific career, he entered the Paris Conservatory in 1817 and studied music composition under the French composer François Adrien Boieldieu (1775–1834) In 1829 Adam's one-act opera *Pierre et Catherine* was successfully produced, fifty-two more works followed, of which one of the most famous was the ballet *Giselle* (1841) His music is distinguished by its daintiness and finish He was made professor of musical composition at the conservatory in 1849 His autobiography was published in 1860

ADAM, Robert (1728–92), British architect and furniture designer, born in Kirkcaldy, Scotland, and educated at the University of Edinburgh and in Rome, Italy. While in Italy he made detailed drawings and studies of the remains of the private palace of the Roman emperor Diocletian (q v), which he later collected in *The Ruins of the Palace of Diocletian* (1764) From 1762 to 1768 Adam served as architect to George III (q v), King of England, from 1769 to 1771, Adam designed an entire section of London, known as Adelphi, as a single architectural unit Much of his work, including Adelphi, was done in collaboration with his less-celebrated brothers John, James, and William. James Adam served as Robert's assistant and succeeded him as architect to the king

The architecture of the Adam brothers is notable for harmony of design and proportion and for a prevailing feeling of lightness and spaciousness. Even more important than their architectural contributions, however, was their conviction that the interior decoration of a building, as well as its plan and construction, is a proper concern of the architect. They designed much of the furniture for many of the town and country homes they created Adam furniture, distinguished by grace, lightness, and simplicity, is important in the history of furniture design and is still admired, *see* FURNITURE *18th-Century England.* In the decoration of furniture and interiors, the Adam name is particularly associated with motifs derived from wreaths, ancient vases, the honeysuckle plant, and fans.

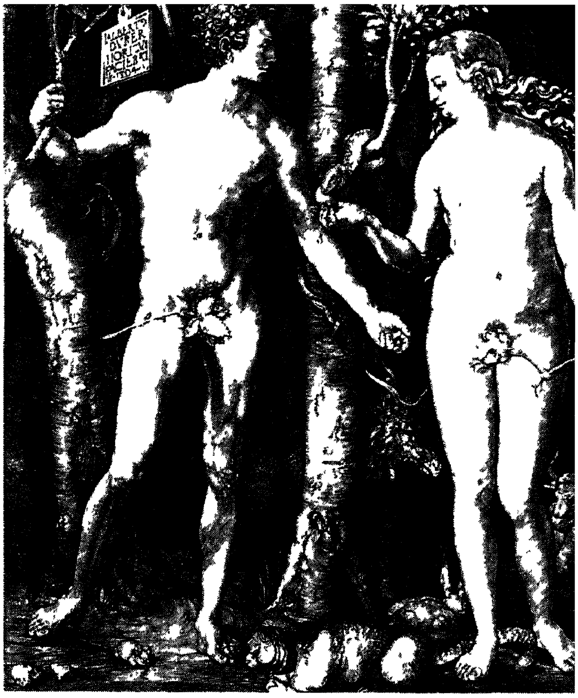
ADAM AND EVE, in the Old Testament, and in the tradition of the Jewish, Christian, and Muslim religions, the first man and woman, the progenitors of the human race The name Adam is related to *ādamāh,* the Hebrew word for "earth", and is used in the Bible both as a proper noun to designate the first man and a common noun to designate man in general, or all mankind. The name Eva or Eve (*hawwāh*) is related to the Hebrew *hayyah* ("the living one"), she received the name because she was the "mother of all living" (Gen 3.20)

The Old Testament book of Genesis contains two accounts of the creation of Adam In the first version (Gen 1 26–32), the universe is created in six days and mankind is created on the sixth day Man is made in the image of God and is given dominion over all the plants and animals of the earth In the second version (Gen 2 7–25), man is created from the dust of the earth and is placed as a caretaker in a garden situated in Eden (q v) and planted with all varieties of trees Man is permitted to eat the fruit of all the trees except one, the "tree of the knowledge of good and evil", the fruit of which he may not eat, under penalty of death From one of his ribs, woman is made to be a helpmate to Adam

Through the serpent, who assures Eve that she and Adam will not die, the woman is beguiled into eating the fruit of the forbidden tree and inducing Adam to eat it also The first consequence of their act is that they realize they are naked, and they make "aprons" of fig leaves to clothe themselves Called to account by God for their disobedience, Adam pleads in extenuation that the woman gave him the fruit, and Eve pleads that the serpent lured her into it All three are punished by God, the serpent by becoming the most cursed of the animals, Eve by increased troubles and pain, particularly in childbearing, and Adam by being forced to secure his food through the sweat of his brow, tilling the soil until he returns to the dust from which he was made. God makes garments for the pair from the skins of animals He banishes them from Eden, placing cherubim (*see* CHERUB) with flaming swords to prevent them from returning and eating the fruit of the tree of life, which confers immortality (Gen 3)

Two sons, Cain and Abel (qq v), are born to the pair, and in his 130th year Adam begets Seth Adam dies at the age of 930 years, after having fathered sons and daughters (Gen 4, 5·1–5) *See* GENESIS

In the Jewish rabbinical lore, Adam was originally a gigantic being, reaching from earth to heaven God removed a portion of every limb while Adam was sleeping Thus Adam lost his vast stature, but remained perfect in every part According to medieval Jewish lore, the first wife of Adam was Lilith (q v), who deserted him after a quarrel. In a Midrashic version of the story of Adam, his extraordinary qualities excited envy among the angels, and the angel Sammael tempted the pair to their fall In Muslim tradition, all the angels except Eblis paid homage to Adam For his refusal Eblis was expelled from Paradise and in revenge tempted Adam and Eve to sin The story of Adam and Eve has its counterpart in the mythologies of many peoples, *see, for example,* CREATION EPIC, BABYLONIAN, DEUCALION S L



Adam and Eve in the Garden of Eden with the serpent (from an engraving by the 15-century German artist Albrecht Durer) Parke-Bernet Galleries

ADAM DE LA HALLE, *or* ADAM LE BOSSU (1235?–85?), French troubadour, born in Arras He was a member of the retinue of Charles of Anjou, who became king of Naples, as Charles II (q v), in 1265 Adam is noted for two works, *Le Jeu de la Feuillée* ("The Game of the Foliage", about 1262), a prose drama that is commonly considered the earliest comedy in French, and the musical play *Le Jeu de Robin et Marion* ("The Game of Robin and Marion", about 1283), regarded as the first comic opera

ADAMIC, Louis (1889–1951), Slovenian-born American writer, born in Blato, Slovenia (now in Yugoslavia). He came to the United States in 1913 and was naturalized in 1918 Adamic was an advocate of closer ties between the American and Slavic peoples From 1943 to 1944 he served as first president of the United Committee of South-Slavic Americans, and was honorary president from 1944. His best-known work is *The Native's Return* (1934), a study of contemporary Yugoslavia Among his other books are *Dynamite The Story of Class Violence in America* (1931), *Cradle of Life* (1936), *My America* (1938), *My Native Land* (1943), *A Nation of Nations* (1945), and *The Eagle and the Roots* (posthumously published, 1952)

ADAMNAN, Saint, *or* ADOMNAN, SAINT *or* EUNAN, SAINT (625?–704), Irish abbot and writer, born in County Donegal He entered the monastery on the Scottish island of Iona and in 697 was elected abbot His rule over that community was marred by controversy The Irish church then ascribed to the Eastern views on dates for observing Easter (q.v.) and the form of the tonsure, the sacred rite of shearing the hair of a newly received cleric Adamnan, a proponent of the Roman or orthodox views, tried to put them into practice in Iona He was thwarted, and his mortification at his failure is thought to have caused his death His works include *On The Holy Land,* an account containing information that he claimed had been communicated by a French ecclesiastic who had lived in Jerusalem. The work contains valuable information about Palestine in the early ages of Christianity He is most famous, however, for his *Life of Saint Columba,* a biography of Saint Columba (q v), the converter of the ancient Picts (q v) and founder of Iona Along with accounts of miracles and many other stories, the biography contains nearly all the information that has been preserved about the early Irish church The traditional feast day of Adamnan is Sept 23.

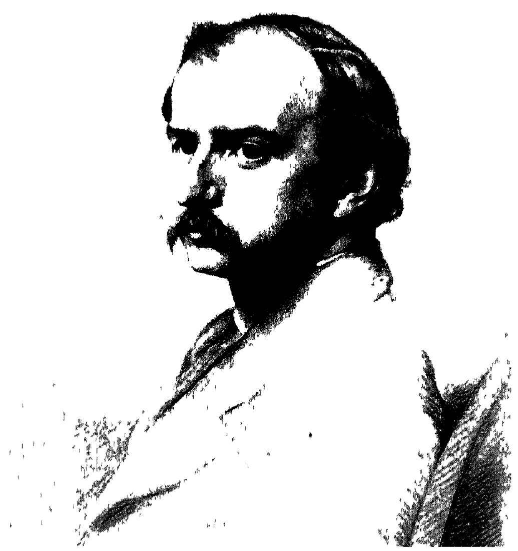
ADAMS, American family prominent in United States history and education The most distinguished members of the family are Abigail Smith Adams, John Adams, and John Quincy Adams, second and sixth Presidents of the U S , respectively; see separate articles

Charles Francis Adams (1807–86), American diplomat and editor, grandson of John Adams and son of John Quincy Adams, born in Boston, Mass , and educated at Harvard University He was admitted to the bar in 1829 Adams served for five years in the Massachusetts legislature as a member of the Whig Party In 1858, and again in 1860, he was elected to the United States House of Representatives from Massachusetts as a member of the Republican Party In 1861 he was appointed minister to Great Britain by President Abraham Lincoln (q v). His skillful handling of this position during the American Civil War (1861–65), when the British government rendered aid to the Confederacy, is an outstanding chapter in the history of American diplomacy (*see* CIVIL WAR, THE AMERICAN) In the so-called Trent Affair, the first major crisis in Anglo-American relations during the war, his calm and tact were instrumental in averting hostilities between the two nations Although he failed to prevent the sailing of the *Alabama,* a raider built in Great Britain for the Confederacy, his efforts with the British government later resulted in the detention of other Confederate vessels He resigned as minister to Great Britain in 1868 In 1871 he became a member of the *Alabama* Claims (q v) tribunal He edited the *Life and Works of John Adams* (10 vol , 1850–56), the *Memoirs of John Quincy Adams* (12 vol , 1874–77), and the *Familiar Letters of John Adams and His Wife Abigail* (2 vol , 1876)

Charles Francis Adams (1835–1915), American public official and historian, son of Charles Francis, born in Boston, Mass , and educated at Harvard University After serving as an officer in the Union army during the American Civil War, he became railroad commissioner of Massachusetts, and from 1884 to 1890 he served as president of the Union Pacific Railroad From 1893 to 1895 he was chairman of the Massachusetts Parks Commission In 1895 he became president of the Massachusetts Historical Society, and in 1901, president of the American Historical Association His works include *Railroads. Their Origin and Problems* (1878), *Richard Henry Dana a Biography* (1891), *Three Episodes of Massachusetts History* (1892), and *Lee at Appomattox* (1902)

Henry Brooks Adams (1838–1918), American historian, son of Charles Francis (1807–86), born in Boston, Mass , and educated at Harvard University After his graduation (1858) from Har-

American historian Henry Brooks Adams (from an 1868 sketch by Samuel Lawrence) Houghton Mifflin Co



vard, Adams traveled for two years in Germany and Italy From 1860 to 1868 he was private secretary to his father He then decided to become a teacher, and from 1869 to 1876 was assistant professor of history at Harvard, where he introduced the seminar system of instruction. During part of that period he also edited the periodical *North American Review* After 1885 he devoted himself almost entirely to historical research and writing Adams traveled extensively in Europe, spending considerable time in France

His most impressive achievement as a historian is *A history of the United States of America during the Administrations of Thomas Jefferson and James Madison* (9 vol., 1889–91), in which Adams contends that the decisions and policies of the period from 1801 to 1817 shaped the main course of subsequent American political development Among his other writings are two biographies, *The Life of Albert Gallatin* (1879) and *John Randolph* (1882) He wrote two novels, *Democracy* (1880), a political satire, and *Esther* (1884), a story about New York City society

His *The Degradation of the Democratic Dogma* (1919) includes three essays on his philosophy of history In this work Adams introduced his dynamic theory of history Derived from the second law of thermodynamics (q.v), the theory maintains that mechanical energy is in a constant state of dissipation Human history is similarly devoid of purpose and consists merely of a succession of energy phases Another major contribution to the philosophy of history is found in the privately printed *Mont-Saint-Michel and Chartres* (1904), a sensitive and penetrating discussion of medieval culture In his most widely read book, *The Education of Henry Adams* (1906; posthumous Pulitzer Prize, 1919), he discusses the fundamental character of the history of Western civilization The book is an autobiography written in the third person with detached skepticism and delicate irony. One of Adams' main concerns in the work is to indict the formal educational system of his day for its failure to prepare an intelligent man for the chaos of modern life

Adams' works reveal a profound concern with the destiny of the modern world His prose style is forceful, as is his treatment of ideas Although he thought of his privately published books as unsatisfactory achievements, the judgment of later critics places them among the important works of the 20th century

Brooks Adams (1848–1927), American historian, youngest son of Charles Francis (1807–86), born in Quincy, Mass , and educated at Harvard University. Admitted to the bar in 1871, he practiced law for ten years before beginning his career as a writer His first important work, *The Emancipation of Massachusetts* (1887), is a penetrating analysis of the religious and political forces that shaped the development of that colony In *The Law of Civilization and Decay* (1895) he propounded an economic interpretation of history based on the factors governing the rise and fall of commerce Adams applied the interpretation to his own times in *America's Economic Supremacy* (1901) and *The New Empire* (1902) His other writings include *The Theory of Social Revolutions* (1913), a brilliant, though pessimistic, study of the American democratic system

Charles Francis Adams (1866–1954), American lawyer and financier, grandson of Charles Francis (1807–86) and son of the Massachusetts politician John Quincy Adams (1833–94), born in Quincy, Mass , and educated at Harvard University Admitted to the bar of Massachusetts in 1893, he later practiced law in Boston A prominent member of the Republican Party, he was appointed secretary of the navy by President Herbert Hoover (q v) in March, 1929, and held this position for four years After 1932 he devoted his attention to his business interests

O Ha

ADAMS, Abigail Smith (1744–1818), wife of John Adams, second President of the United States, and mother of John Quincy Adams

Abigail Adams, wife of John Adams, second President of the United States, and mother of John Quincy Adams, the sixth President

National Gallery of Art — Gift of Mrs Robert Homans

(qq.v), sixth President of the U S , born in Weymouth, Mass. She was the daughter of the Reverend William Smith, minister of the Congregational Church in Weymouth Through her mother, Elizabeth Quincy, she was descended from the 17th-century Puritan preacher Thomas Shepard (1605–49) of Cambridge Although she had little formal education, she was among the most influential women of her day, especially as a fashion leader and social arbiter During and after the American Revolution she was separated for long periods of time from her husband, who was first a delegate to Congress and later engaged in diplomatic business in Europe Her letters to him present a vivid picture of the time After 1800 she lived in Washington, D.C , and thereafter in Braintree, Mass The *Familiar Letters of John Adams and His Wife Abigail* (2 vol , 1876), published with a memoir by their grandson Charles Francis Adams (*see under* ADAMS: *Charles Francis Adams* (*1807–86*), and later collections of her letters show that she was a perceptive, sagacious, warmhearted, and generous woman

ADAMS, Evangeline Smith (1873–1932), American astrologer, born in Jersey City, N.J , and educated at a private school in Andover, Mass She originated "Adams' Philosophy", a synthesis of the occult theories of Oriental and Western thought After building a reputation as a successful astrologer in the United States, she tried to have astrology (q v.) legalized in Great Britain She is credited with having forecast the date of the death of Edward VII (q v), King of Great Britain She was well known as a radio broadcaster and newspaper columnist on the subject of astrology.

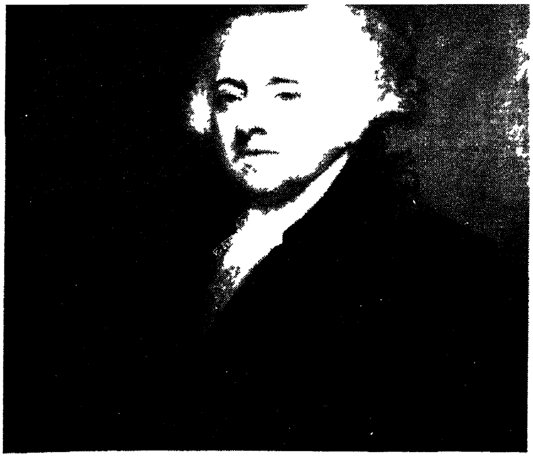
ADAMS, Franklin Pierce, known as F.P.A. (1881–1960), American writer of humorous prose and verse, and newspaper columnist, born in Chicago, Ill , and educated at the Armour Scientific Academy in Chicago and at the University of Michigan He was best known as the writer of the column "The Conning Tower", which appeared in the New York *World,* the New York *Herald-Tribune,* and the New York *Post* In 1938 Adams became a member of the staff of authorities on the popular radio program *Information Please.* His writings include *Tobogganing on Parnassus* (1910); *By and Large* (1914), *Half a Loaf* (1927), a collection of light verse, *Innocent Merriment* (1942), and *Nods and Becks* (1944) He edited the *F.P.A Book of Quotations* (1952)

ADAMS, Hannah (1755–1831), American writer, born in Medfield, Mass Probably the first American woman to become a professional writer, she wrote *Views of Religious Opinions* (1784, title changed to *Dictionary of Religions* in 4th ed), *History of New England* (1799), and *Evidences of Christianity* (1801)

ADAMS, Herbert (1858–1945), American sculptor, born in West Concord, Vt , and trained in Boston, Mass , and Paris, France. He is especially known for his busts of women, including "A Young Lady" (Metropolitan Museum of Art, New York City) His bronze memorial in Northampton, Mass , and bronze statues of the Unitarian clergyman William Ellery Channing in Boston and of the poet and journalist William Cullen Bryant (qq v) in New York City are other noted examples of his art

ADAMS, James Truslow (1878–1949), American historian and editor, born in Brooklyn, N Y , and educated at Brooklyn Polytechnic Institute and at Yale University He worked as a stockbroker from 1900 to 1912 After serving as a captain in the United States Military Intelligence Division during World War I, he retired to write historical works He won a Pulitzer Prize in 1922 for his *The Founding of New England* (1921). His *Epic of America* (1931) became a best seller He made a study of the famous Adams family of Massachusetts, to which he was not related, this study of the second President of the United States John Adams (q v.) and his descendants resulted in *The Adams Family* (1930) and *Henry Adams* (1933) He later became editor in chief of the *Dictionary of American History* (6 vol., 1940), the *Atlas of American History* (1943), and the *Album of American History* (1944–46) His other works include *The March of Democracy* (2 vol , 1932–33), *The Living Jefferson* (1936), and *Big Business in a Democracy* (1945)

ADAMS, John (1735–1826), second President of the United States and father of the sixth President, John Quincy Adams (q v), born in Braintree (now Quincy), Mass , where his forebears had settled in 1640. Trained in law at Harvard College, he was admitted to the bar in 1758. In 1764 he married Abigail Smith (*see* ADAMS, ABIGAIL SMITH) Adams had a vigorous philosophical mind and great parliamentary talents A leader in the early struggle for independence, he attacked the Stamp Act, the Boston Port Bill (qq.v.), and other repressive measures imposed on the American colonies by the British parliament; *see* AMERICAN REVOLUTION As a member of the Continental Congress (q.v) he was influential in the adoption of the Declaration of Independence (q.v.). In 1782 he secured loans for his government from Dutch financial interests, and he participated in the negotiation of a peace treaty with Great Britain; *see* PARIS, TREATY OF He



John Adams by American painter Gilbert Charles Stuart (1755–1828) National Gallery of Art — Gift of Mrs. Robert Homans

served for three years (1785–88) as the first United States minister to the Court of Saint James in London, *see* SAINT JAMES'S PALACE. As Vice-President under George Washington (q.v.) he was active in developing Senate procedures and cast the deciding vote in several important cases.

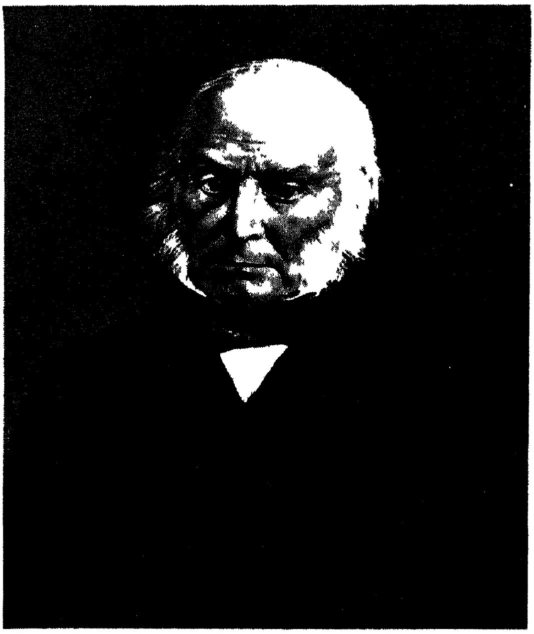
The election of 1796 ushered in a tumultuous period in American politics, both domestic and foreign. Two distinct political groups had developed: the Federalist Party (q.v.), led by Alexander Hamilton (q.v.), and the Republicans, later known as Democratic-Republicans (*see* DEMOCRATIC PARTY), led by Thomas Jefferson (q.v.). Hamilton, whose controversial policies as secretary of the treasury under Washington had alienated much of the electorate, was obliged to stand aside when a caucus of Federalists chose Adams and Thomas Pinckney (1750–1828) of South Carolina as their candidates to oppose the Republican nominees, Jefferson and Aaron Burr (q.v.). During the campaign Hamilton, realizing that he would have little influence on Adams, plotted to throw the election to Pinckney, a maneuver that weakened the Federalists and caused Adams to distrust Hamilton. Under rules of the Constitution in effect at that time, each elector voted for two men for President, the candidate who won the most votes become President and the candidate with the next highest number became Vice-President. By a vote of 71 to 68 the Federalist Adams won over the Republican Jefferson, who thus became Vice-President.

At the beginning of his term Adams attempted to negotiate a settlement of differences between the U.S. and France, *see* XYZ AFFAIR. When the negotiations failed, Congress appropriated funds to establish a department of the navy and to raise an army of 10,000 volunteers. An undeclared war at sea resulted in heavy losses on both sides. Peace was obtained in 1800 after Adams sent a special commission to Paris. The President's popularity declined, however, as a result of the Alien and Sedition Acts (q.v.), which had been passed in 1798 in an attempt to suppress criticism of the administration. Adams was also handicapped by the antagonism of the Hamilton faction of the Federalist Party, and the election of 1800 resulted in a victory for the Republicans Jefferson and Burr. Adams subsequently lived and wrote in retirement at his Massachusetts home. He died on the fiftieth anniversary of the signing of the Declaration of Independence, July 4, 1826. His long-time colleague and opponent, Thomas Jefferson, died on the same day. N.W.P.

ADAMS, John Quincy (1767–1848), sixth President of the United States, eldest son of John Adams (q.v.), the second President. He received his earliest education from his parents at their home in Quincy, Mass. At eleven he accompanied his father to Europe, where he continued his education and broadened his interests. On returning to America he graduated from Harvard College, and after three years of study in a Newburyport law office, he set up his own practice in Boston.

Adams entered public service in 1794, when President George Washington (q.v.) appointed him minister to the Netherlands. Three years later his father designated him minister to Prussia; Adams resigned from this post when Thomas Jefferson (q.v.) became President in 1801. In 1803 Adams, a member of the Federalist Party (q.v.), was elected United States Senator from Massachusetts. Finding himself opposed to the program of his party, he resigned his seat in 1808. In the following year President James Madison (q.v.) appointed him minister to Russia, where he arranged several trade agreements. In 1814 Adams helped to draw up the Treaty of Ghent (*see* GHENT, TREATY OF), after which he represented the U.S. in London. As secretary of state under President James Monroe (q.v.), Adams negotiated the treaty by which the U.S. obtained East and West Florida in return for renouncing its claims to Texas. He also convinced the President that the U.S. should make clear its opposition to any European colonization or interference in the New World. This principle became the basis of the Monroe Doctrine (q.v.), which was promulgated in 1823.

During the campaign of 1824, Adams ran for President against Senator Henry Clay (q.v.) of Kentucky, and Senator Andrew Jackson (q.v.) of Tennessee. The election was submitted to the House of Representatives, and Clay threw his support to Adams When the latter was elected, Jackson and his friends charged that a "corrupt bargain" had been made between the two candidates Adams and Clay formed an intersectional party known as the National Republicans and Jackson's followers came to be called Democrats, *see* DEMOCRATIC PARTY



John Quincy Adams National Gallery of Art

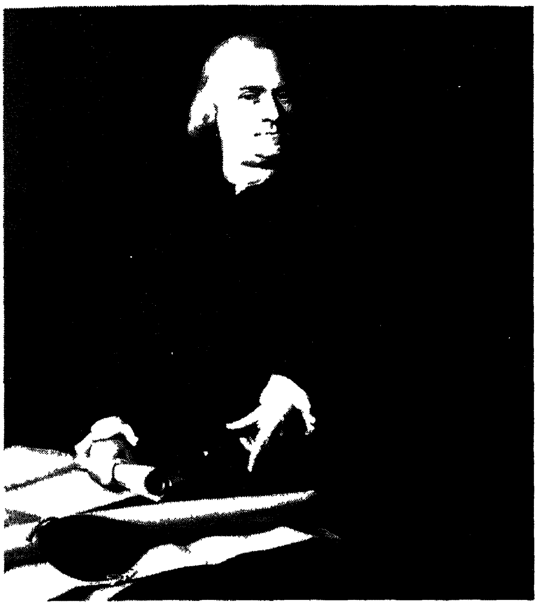
As chief executive, Adams frequently allowed political opponents to remain in appointive positions, and sometimes even chose Jackson's men to fill vacancies He refused to sign a treaty by which the Creek Indians surrendered their holdings in Georgia, because he believed that the treaty was obtained by fraud. He actively supported the construction of roads and canals at national expense, the development of western lands, and the exploration of the Pacific Northwest coast These programs aroused considerable opposition throughout the southern States, however, and in the election of 1828 Adams was decisively defeated by Jackson. He was elected to the House of Representatives from Massachusetts and served in the House from 1831 until his death in 1848 A vigorous opponent of slavery and the Mexican War (qq v), Adams led the fight against the so-called gag rules (q v), by which antislavery petitions had been suppressed and the freedom of Congressional debate severely restricted N.W P

ADAMS, Maude, stage name of MAUDE KISKADDEN (1872–1953), American actress, born in Salt Lake City, Utah. She appeared in New York City in *The Midnight Bell* (1888), and then spent three years with the Charles Frohman Stock Company (*see* FROHMAN, CHARLES) She played in *The Masked Ball* (1892) with the American actor John Drew (*see under* DREW), starred in *The Little Minister* (1896) by the Scottish dramatist Sir James Matthew Barrie (q v), and played the Duke in *L'Aiglon* ("The Eaglet", 1900) by the French dramatist Edmond Rostand (q v) From 1905 to 1907 she played the title role in Barrie's *Peter Pan,* probably her most popular performance She retired at the height of her stage career after appearing in Rostand's *Chantecler* (1910–11) After 1937 she was instructor in dramatics at Stephens College, Colombia, Mo

ADAMS, Samuel (1722–1803), American Revolutionary patriot and statesman, born in Boston, Mass , and educated at Harvard College After leaving college in 1740, he was successively a law student, a clerk in a countinghouse, and a merchant His business failed, and he later became a partner with his father in a brewery. This enterprise also failed after his father died Meanwhile, he had been active in Boston political circles In 1756 he was elected tax collector of Boston, a position he held for eight years. His outspoken opposition to strict enforcement of the Sugar and Molasses Act (q.v.) in 1764 brought him into prominence in colonial politics In 1765, in the course of the controversy aroused by the Stamp Act (q.v.), he drafted the instructions to the Boston representatives in the General Court, the legislative body of Massachusetts He was elected to the lower house of the General Court in the same year. The radical majority in the lower house elected him clerk in 1766, and in this position, which he held until 1774, he gradually assumed leadership of the movement in Massachusetts that advocated independence from Great Britain.

Adams decisively influenced every important aspect of the prerevolutionary struggle against British rule. In the realm of practical politics, he promoted the formation of the Boston chapter of the Sons of Liberty (q.v.) and sponsored the Committee of Correspondence of Boston (*see* COMMITTEES OF CORRESPONDENCE) He led the fight against the Townshend Acts (q.v.), headed the demonstrations that led to the Boston Massacre (q v.), directed the Boston Tea Party (q v), and figured significantly in other outstanding events of the period He rapidly acquired an intercolonial reputation both through these activities and as a literary agitator and revolutionary ideologist. Many of his writings, chiefly political pamphlets, were widely circulated and read A proponent of the natural rights of man (*see* NATURAL

LAW), he was in the vanguard of those Americans who challenged the authority of the British Parliament and championed rebellion Stylistically, his writings are lucid, forceful, and epigrammatic Adams' contributions to the *Gazette,* a Boston newspaper, constituted a voluminous phase of his agitational work Frequently written under pseudonyms, his newspaper articles inveighed against reconciliation with the mother country, they won many converts for the radical cause and generally deepened the mood for revolutionary action



Portrait of Samuel Adams by American artist John Singleton Copley (1737–1815) Museum of Fine Arts, Boston

In June, 1774, following the passage of the Boston Port Act (q v), Adams climaxed his activities against that and similarly oppressive measures by securing the approval by the Massachusetts General Court of a resolution to send representatives to the first Continental Congress (q v) Elected a delegate to the Congress he soon became the leader of the radical faction that demanded strong measures against Great Britain Adams was a central figure in the episode that precipitated the American Revolution (q v) On April 18, 1775, his arrest and that of his colleague, John Hancock (q v), were ordered by General Thomas Gage (q.v), the royal governor of Massachusetts The first pitched battle of the Revolution occurred when, on the following day, British regulars, en route to Adams' temporary home in Lexington, Mass , met the armed resistance of local patriots (*see* CONCORD, BATTLE OF, LEXINGTON)

Adams was a delegate to the second Continental Congress, which convened at Philadelphia, Pa , in May, 1775, and he subsequently signed the Declaration of Independence (q v) He remained a member of the Continental Congress until its dissolution (1781), but he was frequently at odds with his colleagues on matters of national policy Because his strenuous opposition to a strong national government impeded mobilization of the nation for a speedy victory over Great Britain, his popularity and effectiveness as a leader gradually waned In 1779 Adams was a member of the committee that drafted the Massachusetts State constitution, and he was instrumental also in securing the ratification by Massachusetts of the Constitution of the United States (q v) in 1788 He was lieutenant governor of Massachusetts from 1789 to 1793 and governor from 1794 to 1797.

ADAMS, Samuel Hopkins (1871–1958), American journalist and author, born in Dunkirk, N Y , and educated at Hamilton College. From 1891 to 1900 he was a newspaper reporter and feature writer on the staff of the New York *Sun,* and from 1903 to 1905, on the staff of *McClure's Magazine* As a journalist he played an important part in the muckraking movement, an attempt to expose the corruption in business and politics His most notable disclosure was a series of articles on the evils of the patent-medicine industry, which appeared in the periodical *Collier's* and were collected in *The Great American Fraud* (1906) His novel *Revelry* (1926) deals with corruption in the administration of President Warren Gamaliel Harding (q v) He also wrote biographies, short stories, and several motion-picture scripts

ADAMS NATIONAL HISTORIC SITE, home of the noted American Adams family from 1787 to 1927, in Quincy, Mass The house, built in 1731, was acquired by John Adams (q.v), second President of the United States, in 1787, and enlarged by him and his descendants Four generations of the Adams family lived in the house The many different styles of furnishings reflect the tastes of all the generations which occupied the house The 4 77-acre site includes the house, library, garden, and stables It was designated a national historic site in 1946 and is administered by the National Park Service

ADAM'S NEEDLE. *See* YUCCA

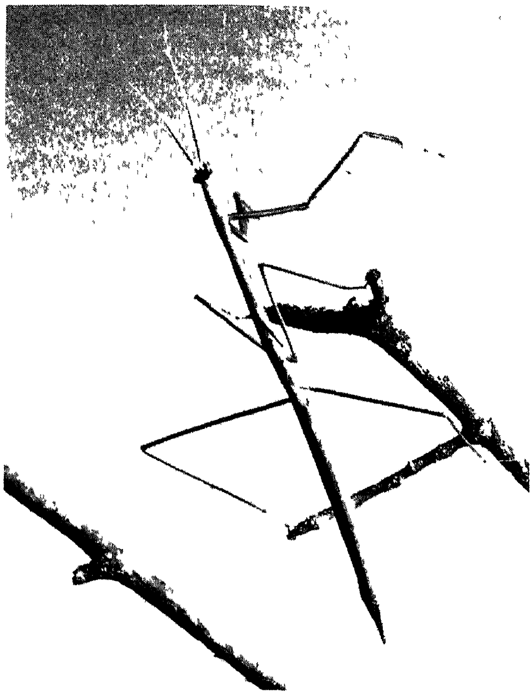
ADAMS PEAK (Singhalese, *Samanhela*), mountain in s central Ceylon, about 44 miles E of Colombo, Ceylon The 7360-ft summit contains a depression, about 5 ft long by about 2½ ft. wide, that is shaped like a human footprint The origin of the footprint is explained in various ways depending on religious and cultural tradition According to Muslim tradition the summit was the scene of the penance of Adam (after his expulsion from Paradise), during which he stood on one foot for a thousand years To Buddhists the footlike depression is the sacred footmark left by Buddha on his departure from Ceylon, the Hindus claim it is the footprint of their god Siva

ADANA *or* **SEYHAN,** city in Turkey, and capital of Adana Province, on the Seyhan R, about 240 miles S E of Ankara and 30 mi inland from the Mediterranean Sea It is the fourth-largest city in Turkey Adana is the marketing and distribution center for an agricultural region producing cotton, wheat, barley, grapes, citrus fruits, olives, and tobacco The chief industries of the city are textile manufacturing, tanning, and the processing of wool and various foods Local points of interest include a great stone bridge, built in part during the reign (6th century) of the Byzantine emperor Justinian I (q.v), and the ruins of a castle dating from 782.

Adana was founded in 63 B C by the Roman statesman Pompey the Great (*see under* POMPEIUS). For several centuries thereafter it was a way station on a Roman military road leading to the East The city declined in importance after the fall of the Roman Empire (736 A D) but was rebuilt in the 8th century by Harun al-Raschid (q.v.), Caliph of Baghdad Adana was held by Egypt from 1832 to 1840, when it was restored to Turkish rule Pop (1970 est) 351,655.

ADAPAZARI, city of Turkey, in Kocaeli Province, on the Sakarya R, 24 miles E of Izmit, the provincial capital, and 80 miles E of İstanbul. A road junction and rail-spur terminus, Adapazari is a trade center in a farming area Railroad and agricultural machinery are manufactured in the city, and iron, zinc, and copper are mined nearby Pop. (1970 est.) 101,590.

ADAPTATION, special structure or behavior of a living organism that makes it better able to survive in a particular environment Adaptation is considered to be an ecological phenomenon (*see* ECOLOGY), one of the many interrelationships between an organism and its environment Adaptation involves adjusting to broad environmental factors, such as climate and food supply, as well as making use of specialized features that enable the organism to take advantage of conditions peculiar to its environment. Adaptation of a species persists through the evolutionary process of natural selection (q v); characteristics that give a species an advantage in coping with its environment favor the species for survival over species that are less well adapted In a sense the environment "selects" for survival those organisms that best meet the challenges of the environment, *see* EVOLUTION



The walkingstick so closely resembles the twigs on which it rests that it is usually not noticed

National Audubon Society

Climate and Food Supply. All living organisms must adjust to climatic conditions or become extinct. The phenomenon of hibernation (q.v) permits many animals to sharply reduce their normal food and heat requirements during the winter, when food supplies are low Such animals also adapt to cold weather with extra layers of fat and thicker fur During winter in the Temperate Zones, deciduous trees and shrubs lose their leaves, and buds are covered by bud scales, thereby preserving delicate tissues from direct exposure to freezing temperatures. Bulbous plants may be said to show a sort of hibernation; the green leaves are shed, and the plant lives on food materials stored in scale leaves in the bulb.

Competition among animals for food and among plants for light reveals many adaptations. For example, vinelike plants survive in dense forests because their natural pattern of growth allows them to grow rapidly toward the available sunlight. Some animals have become adapted to special types of food, which reduces competition with other animals The anteater (q.v.), for example, feeds on ants and other small insects, and its mouth parts and stomach are especially suited to this diet In contrast, cattle live wholly on plants, and their teeth and stomachs are adapted to a diet heavy in cellulose, which many other animals, including humans, cannot digest

Mimicry. Many plants and animals have evolved so that they resemble organisms that are ordinarily shunned or not noticed by predators Birds do not prey on butterflies of the genus *Danaus* because of their repellent taste and odor, a number of other butterflies, however, have developed color patterns like that of *Danaus* and are likewise disregarded by predators The praying mantises, the walkingsticks, and some other insects so closely resemble twigs that predators often overlook them In a similar way, the wings of the lappet moth resemble leaves in color and venation In the deserts of South Africa grow "living stones", plants of the genus *Lithops,* which have fleshy leaves that closely resemble the stones among which they grow They escape the notice of desert animals that would otherwise eat them

Protective Coloration. Like mimicry, protective coloration helps animals avoid notice Their colors and patterns simulate those of the environment to such an extent that they constitute a type of camouflage (q v) Arctic animals, such as the polar bear and snowy owl, are perpetually white like the snow and ice around them In northern countries where snow falls in winter but not throughout the year, certain animals change color with the seasons The arctic fox and the ermine are examples of such adaptation, their fur is white in winter and dark in summer

In addition, changes in color may evolve in accordance with more local conditions Races of white mice have evolved in the white sands of the Tularosa Basin of New Mexico, whereas darker strains inhabit both tawny-colored areas of desert and a lava flow near the white sands In London, where industry has created sooty conditions in the past century, species of moths with dark-grey wings have developed from light-winged moths that live in country areas The sooty-colored wings of the London moths harmonize with the grimy color of tree trunks and buildings This phenomenon has been called industrial melanism.

Seed Dispersal. Plants have evolved remarkable mechanical devices for distributing seeds by means of wind, water, and animals In mustard and the California poppy, the seed capsules burst open and, like catapults, hurl seeds considerable distances. The downy tuft of the dandelion acts like a parachute, allowing seeds of the plants to float on the wind to new locations The seeds of certain plants that grow on islands, such as the beach morning glory, are distributed by floating across the water

Animals transport seeds in many ways Seeds of cocklebur, bur clover, horehound, and bur marigold are contained in capsules that bear tiny hooks or barbs These barbs catch on the hair of animals and later the capsules fall off the animals at another place Similarly, animals that eat berries and other fruits swallow the seeds along with the flesh and eliminate the seeds at other locations

Pollination. Seed plants are pollinated in three ways by water, by wind, and by animals In water pollination, pollen-bearing organs break off the male plants and are carried by tides or currents through the water to the female plants In wind pollination the anthers of male flowers open on dry days and release vast quantities of pollen Showers of pollen can be seen to fall from pine trees on such days

Animal pollination of flowers is carried on mostly by insects and birds When animals visit the flowers to secure nectar, pollen, or both, adaptations of the flower structure ensure that the animal carries pollen away with it The pollen is

The salsify, or oyster plant, is one of the plants the seeds of which are dispersed by wind

National Audubon Society

then deposited in other flowers that the birds or insects visit The shape of many flowers, such as snapdragons, foxgloves, and sunflowers, is an example of adaptation to suit the size and habits of particular insects The yucca moth (q.v) pollinates the yucca flower in which she lays her eggs, later, the moth larvae eat a few of the seeds in the pod Hummingbirds (q v) pollinate long, tubular, brightly colored flowers, such as those of the trumpet vine *See* Honeybee Pollination

Symbiosis. Pollination may be considered a process in which animals and plants have adapted to each other Many other symbiotic arrangements, relationships that benefit both the plant and the animal, have developed One example of such adaptation is the South American ant tree (*Triplaris*), biting ants inhabit cavities in the stem and thorns of the plant and protect it from other animals The plant, in turn, offers shelter to the ants Other examples of symbiotic adaptation are lichens (q v), and nitrogen-fixing bacteria that live in the roots of legumes (*see* Nitrogen Fixation, Saprophyte)

See also Commensalism, Symbiosis; Variation

S C

ADDAMS, Jane (1860–1935), American social reformer, born in Cedarville, Ill, and educated at Rockford Female Seminary, Women's Medical College, and in Europe In 1889 she established Hull House (q v) in Chicago with Ellen Gates Starr (1860–1940) Hull House was one of the first settlement houses in the United States and has long been a leader in its field Jane Addams played a prominent part in the formation of the National Progressive Party in 1912 and of the Woman's Peace Party, of which she became chairman in 1915 In the same year she was elected president of the International Congress of Women at The Hague, Netherlands, and president of the Women's International League for Peace and Freedom, which was established by The Hague congress She was a delegate to similar congresses held in Zurich, Switzerland (1919), Vienna, Austria (1921), The Hague (1922), Washington, D C (1924), Dublin, Ireland (1926), and Prague, Czechoslovakia (1929) She won the Nobel Peace Prize in 1931, sharing the award with the American educator Nicholas Murray Butler (q v) Her works include *Democracy and Social Ethics* (1902), *Newer Ideals of Peace* (1907), *Twenty Years at Hull House* (1910), and *The Second Twenty Years at Hull House* (1930)

ADDAX, genus of desert antelope with only one species, *A nasomaculatus,* belonging to the

Jane Addams, American social worker and founder of the settlement-house concept, talks with a group of young friends family Bovidae (q v) of the order Artiodactyla The addax inhabits the southern Sahara Desert of North Africa from Senegal to the United Arab Republic and is found in lesser numbers in Arabia A strictly herbivorous, cud-chewing mammal, it grazes in herds numbering up to 300 The addax is usually a little over 3 ft high at the shoulder, and is yellowish-white in color, with a brown mane and a black patch at the forehead Both sexes have graceful, ringed horns, wound in an open spiral as long as 43 in Well adapted to the desert, the addax has large hooves for running over sand By eating succulent leaves and wild watermelons it can survive without water for many days The addax seeks shelter from the midday sun, sometimes in caves

ADDER, name that has been widely applied to a number of snakes, both venomous and harmless, but that most frequently refers to snakes of the genus *Vipera,* or a single species within that genus, *V berus,* the common adder These snakes belong to the family Viperidae, the true vipers, *see* VIPER They are characterized by flattened, triangular heads, widened at the rear to accommodate large venom glands, and long, curved fangs that are folded against the roof of the mouth when not in use

The common adder is less dangerous than many other venomous snakes, although the bite may prove fatal to human beings It feeds chiefly on small rodents and seldom grows longer than 2 ft It varies in color from gray, green or brown to velvety black, and on all but the darkest specimens a regular series of zigzag black marks may be distinguished on the back The wide range of the common adder extends east across Europe and Asia to the island of Sakhalin in the Pacific Ocean, south to Spain, and north beyond the Arctic Circle, farther north than any other species of venomous snake It is the only venomous snake in Great Britain Another European variety, the Orsini viper, *V. ursinii macrops,* lives largely on insects and appears to use its venom apparatus rarely, even when picked up in the hands At the other extreme are the daboia, or Russell's viper, *V. russellii,* of southeastern Asia, which probably has caused more human fatalities than any other species of viperine snake, and the asp (q v), *V aspis,* of southern Europe

In Africa larger snakes of different genera in the Viperidae family, notably the puff adder (q v), *Bitis arietans,* are generally called adders The African Cape viper, *B. inornata,* sometimes is called night adder because of its habit of prowling for food at night The Cape viper and the Berg adder, *B. atropos,* are closely related to the puff adder although both are smaller in size and not as widely distributed as the puff adder. No snakes of the viper family are found in Australia or in the Western Hemisphere One serpent found in Australia, however, is the death adder (q v), *Acanthophis antarcticus,* a member of the family Elapidae, commonly known as cobra (q v), resembling closely the true vipers, having the same triangular head and long poison fangs In the United States several harmless snakes, particularly the hognose snake (q v), which is often called puff adder, spreading adder, or hissing adder, are erroneously known as adders J A O

Puff adder, Bitis arietans, *venomous South African snake that attains a length of 5 ft*

New York Zoological Society

Adder's Tongue, Erythronium americanum
American Museum of Natural History

ADDER'S TONGUE, common name of plants in the genus *Erythronium,* belonging to the family Liliaceae The best-known American species is *E. americanum,* a beautiful spring wildflower found in E United States Known also as the trout lily, it has mottled leaves, bears yellow, lilylike flowers, and reaches a height of 12 in

ADDING MACHINE. *See* Computer; Office Machines *Handling Numerical Records.*

ADDIS ABABA, city and capital of Ethiopia, on a hilly plateau about 8000 ft above sea level, about 425 miles S of Asmara A commercial center, it is connected by rail with Djibouti, about 480 mi (by rail) to the N E, in the French Territory of the Afars and Issas, on the Gulf of Aden Modern roads link the city with most of Ethiopia, and air service connects it with leading cities of Africa, Europe, and the Middle East Coffee, grains, hides, and tobacco are among the chief articles of trade Flourishing handicraft industries produce leather, metal, and textile products Points of interest include the imperial palace and government buildings. Addis Ababa is the site of a university established in 1950, and of several schools and libraries.

The city was founded in 1887 by Emperor Menelik II (q.v.) who made it his capital two years later Rebuilding and modernization were initiated under Haile Selassie I (q v), who became emperor in 1930, and were accelerated by the Italians during their occupation of the country from 1936 to 1941 Under Italian rule Addis Ababa was the capital of Italian East Africa

In recent years a number of international conferences have been held in the city, and the United Nations Economic Commission for Africa and the Organization of African Unity established their headquarters here Pop (1971 est) 795,000

ADDISON, Joseph, pen name CLIO (1672–1719), English essayist, poet, and statesman, born in Milston, Wiltshire, and educated at Queen's and Magdalen colleges, University of Oxford At Oxford Addison was known for his skill in writing Latin verse In 1699 he was granted a government pension, which he used for travel to France, Italy, Switzerland, Austria, and Germany, writing and preparing himself for a diplomatic career His most notable literary work of this period was a poem, "The Letter", addressed to one of his patrons, Charles Montagu, 1st Earl of Halifax (*see under* Halifax) In 1704, about a year after his return to England, Addison was commissioned by the government to write a poem celebrating the British victory at the Battle of Blenheim (*see* Blenheim, Battle of) His composition "The Campaign", which was favorably received, was such an aid to the Whig Party (q v) that soon afterward he was appointed a commissioner of appeals

His position in both politics and letters was now firmly established In 1706 he was appointed undersecretary of state, and in 1709, secretary to the lord lieutenant of Ireland, meanwhile, in 1708, he had entered Parliament as a Whig, and he retained his seat for the remainder of his life. In 1709 Addison became a contributor to *The Tatler,* a periodical founded by his friend the English essayist Sir Richard Steele. Two years later, Steele founded another, more popular periodical, *The Spectator,* for which Addison subsequently wrote the finest of his many essays For additional information about these periodicals, *see* Essay, Steele, Sir Richard Addison's literary reputation reached its highest point in 1713, when his tragedy *Cato* was produced in London. In the opinion of most modern critics, this play, an artificial and undramatic work, was overestimated by Addison's contemporaries. It was translated into several European languages, and such influential critics as the French author Voltaire (q v.) pronounced it the finest tragedy in the English language. In 1717 he became secretary of state, in ill health, he resigned the office in 1718

Addison's literary reputation has suffered a decline since his own time, when he was widely considered the most important of English au-

Joseph Addison British Information Services

thors He is now remembered mainly as one of the founders of the modern familiar essay, as a prose stylist of polish, grace, and elegance, and as the creator of Sir Roger de Coverley, one of the most popular characters in English literature Addison's poetry is now generally read only as a typical product of his period, and his dramatic works are rarely produced L T

ADDISON'S DISEASE, chronic disorder resulting from insufficiency of the adrenal glands The disease was first described by the British physician Thomas Addison (1793–1860) in 1855 The cortex, or outer portion, of the adrenal gland secretes hormones that have a vital effect on food metabolism, salt and water balance, and, to a lesser extent, on the reproductive system. The insufficiency can occur after a severe infection such as tuberculosis, or after massive bleeding of the adrenals, or surgery affecting the glands, such as removal of a tumor The resulting lack of hormone secretion causes such symptoms as weakness and fatigability, weight loss, low blood pressure, gastrointestinal distress, low blood sugar, depression and irritability, and increased skin pigmentation A form of pernicious anemia may result from the gastrointestinal disturbances of Addison's disease Once inevitably fatal, the disease is now treated with daily doses of cortisone or hydrocortisone and the use of additional salt in the diet of the victim *See* ADRENAL GLAND, CORTISONE HORMONES

ADDITION, process, in mathematics, of combining two or more numbers to find their sum or total In order to execute this process on arbitrary numbers it is necessary to know all the possible sums of any two digits from 1 through 9 These sums are usually memorized They are displayed in the following table

	0	1	2	3	4	5	6	7	8	9
0	0	1	2	3	4	5	6	7	8	9
1	1	2	3	4	5	6	7	8	9	10
2	2	3	4	5	6	7	8	9	10	11
3	3	4	5	6	7	8	9	10	11	12
4	4	5	6	7	8	9	10	11	12	13
5	5	6	7	8	9	10	11	12	13	14
6	6	7	8	9	10	11	12	13	14	15
7	7	8	9	10	11	12	13	14	15	16
8	8	9	10	11	12	13	14	15	16	17
9	9	10	11	12	13	14	15	16	17	18

To find the sum of any two numbers between 1 and 9, locate the first of the numbers in the vertical column at the left of the table and the other number in the horizontal row at the top of the table The sum is the number in the body of the table at the intersection of the particular row and column

The method for adding several large numbers (that is, numbers greater than 10), such as 237 + 128 + 17, is to arrange them in a vertical array with the coefficients (*see* ARITHMETIC) of corresponding powers of ten in the same column

$$\begin{array}{rcr} 237 & = & 2 \times 10^2 + 3 \times 10^1 + 7 \\ 928 & = & 9 \times 10^2 + 2 \times 10^1 + 8 \\ \underline{16} & = & \underline{ + 1 \times 10^1 + 6} \end{array}$$

The numbers to be added are called summands or addends, and the result of the addition is called the sum or total Beginning with the extreme right-hand column, or the unit column, the sum of these coefficients is obtained either from repeated use of the table above or from memory In the example, this sum is 21, or $2 \times 10^1 + 1 \times 10^0$ The 1 is written in the units column below the answer line, and the 2 (which stands for 2×10 or 20) is placed in the tens column. The technique of adjusting those coefficients greater than 9 is commonly referred to as carrying

The example now appears thus

$$\begin{array}{r} 2 \\ \\ 237 \\ 928 \\ \underline{16} \\ 1 \end{array}$$

Repeating this procedure, the sum of the entries in the tens column is obtained. In the example, this sum is 8, which stands for 8×10 This number is placed under the answer line in the tens column In this case, there is nothing to carry

This is indicated by a zero in the hundreds column Had the sum of the numbers in the tens column been 38, however, the 8 would be placed as before under the answer line in the tens column, and the 3 placed in the hundreds or 10^2 column

This process is repeated until the left-hand column has been added and the sum placed in this column under the answer line, as in the following example

$$\begin{array}{r}237\\928\\16\\\hline 1181\end{array}$$

This method can be used no matter how large the addends or how many of them are involved

It should be noted that members of different classes cannot be added to give a sum in one of those classes In the example $3 + 4 = 7$, the 3 stands for three objects which are denoted by the letter "x", that is $3x$, and if the 4 stands for four of the same objects, that is $4x$, then the sum or total of seven stands for $7x$ If, however, the three stands for $3x$ and the four for $4y$, then the total is $3x + 4y$ because groups of different classes cannot be added together, *see* ALGEBRA Two classes (apples and oranges), however, can be added to give a sum in another class (fruit)

The operation of addition as applied to decimal fractions is illustrated in the following example

$$\begin{array}{r}236.04\\957\ 8\\2071.553\\\hline 3265.393\end{array}$$

The addends are placed so that the decimal points are in a vertical line The decimal point in the sum will occur in the same vertical line

The rule for performing the operation of addition on fractions is shown in the following example

$$\frac{a}{b}+\frac{c}{d}=\frac{ad+bc}{bd}$$

(note that if a and b are numbers, then ab denotes the product of a and b) J McP

ADDRESS, FORMS OF. *See* FORMS OF ADDRESS

ADDRESSING MACHINES. *See* OFFICE MACHINES· *Duplication of Documents.*

ADE, George (1866–1944), American humorist and playwright, born in Kentland, Ind , and educated at Purdue University From 1887 to 1900 he wrote for newspapers in Lafayette, Ind., and Chicago, Ill A group of his feature stories, originally contributed to the Chicago *Record* beginning in 1890, were collected in the volume *Fables in Slang* (1899) This book, the most popular of Ade's works, is distinguished by a witty and perceptive use of American vernacular speech. His other writings include the plays *The County Chairman* (1903) and *The College Widow* (1904)

ADELAIDE, city in Australia, and capital of South Australia State, on the Torrens R , about 7 miles S E of Port Adelaide, and about 500 miles N W of Melbourne The chief industries are the manufacture of motor bodies and vehicles, electrical and electronic equipment, and chemicals and salt Specialized equipment for space rockets and guided missiles is also manufactured. The streets of Adelaide are wide, regularly laid out, and lined with shade trees Among prominent buildings are the Government House and the Anglican and Roman Catholic cathedrals Educational institutions in the city include the University of Adelaide (*see* ADELAIDE, UNIVERSITY OF) Numerous suburbs, including Burnside, Unley, Port Adelaide, and Woodville, are nearby. Adelaide was founded in 1837. Pop (greater city, 1971) 809,466

ADELAIDE, UNIVERSITY OF, coeducational institution of higher learning, located in Adelaide, Australia, and subsidized by the government of South Australia State The university was established in 1874 by an act of the South Australian legislature, opened for instruction in 1876, and was granted its charter in 1881 In 1969 enrollment totaled 9000, the faculty numbered about 540

ADELBERT. *See* ADALBERT

ADÉLIE COAST *or* **ADÉLIE LAND,** French possession in Antarctica, lying between lat. 66° and 67° S and between long. 136° 20′ and 142° 20′ E Jules Sébastien César Dumont d'Urville (q v.), commander of a French antarctic expedition, discovered the region in 1840 and named it for his wife. Area, about 150,000 sq mi

ADEN, former British crown colony and protectorate *See* ADEN (city), SOUTH ARABIA, FEDERATION OF, YEMEN, PEOPLES DEMOCRATIC REPUBLIC OF

ADEN (anc. *Adana*), city, capital, and port of the Peoples Democratic Republic of Yemen Including environs and the Kuria Muria and Perim islands, it formerly constituted the British crown colony of Aden. The city, the largest in the country, is located at the tip of the Arabian peninsula on two small peninsulas of volcanic origin that rise to more than 1000 ft in height. The E peninsula is known as Aden and the W peninsula as Little Aden Because of its position near the entrance to the Red Sea, the city has become one of the busiest fueling stations in the world, servicing most of the ships which pass through the Suez Canal. It is also a transshipment center for the region. A British-built oil refinery, with a yearly production capacity of nearly 7,000,000 tons, is located at Little Aden The principal sources of employment are the refinery and the port complex International air service is provided at the Aden Civil Airport, located at nearby Khormaksar

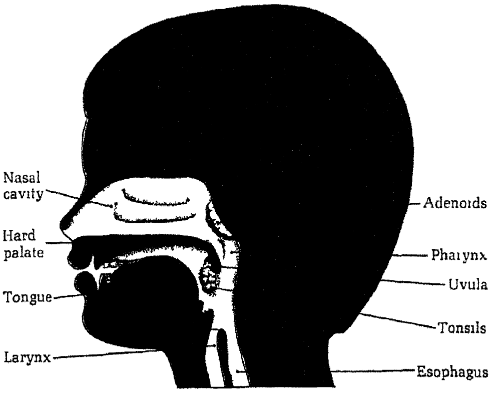
An ancient trade center, the city of Aden was under Egyptian control from the 3rd century B C until it became a Roman colony in 24 B C It fell successively under Ethiopian and Persian control and became associated with Yemen about the 7th century A D It fell to the Turks in 1538 and was incorporated into the sultanate of Lahej in 1728 After British forces seized the city in 1839 it was administered as part of India until it became a crown colony in 1937 Meanwhile, it was declared a free port in 1850, and coastal areas were annexed to the port in 1882 and 1888 During World War II the colony of Aden was an important Allied air base

In 1956 tension arose between Yemen and Great Britain over the Aden Protectorate territory (*see* SOUTH ARABIA, FEDERATION OF) Trade-union and nationalist elements in the colony generally sided with Yemen, and strikes and riots resulted from British efforts to deal with border clashes by force These groups also opposed an announcement by the British government on Aug 20, 1962, of a plan to merge the colony with the Federation of South Arabia, but the merger was effected in January, 1963 In subsequent years Aden was the focus of terrorist attacks by Arab nationalists attempting to expel the British from South Arabia When the federation gained its independence on Nov 30, 1967, Aden became part of the new state, now named the Peoples Democratic Republic of Yemen. Area, 75 sq mi , pop (1968 est), 250,000

ADENAUER, Konrad (1876–1967), German political leader, born in Cologne, and educated at the universities of Freiburg, Munich, and Bonn From 1917 to 1933 he was lord mayor of Cologne and a member of the Prussian legislature Soon after the National Socialist government came to power in 1933, he was barred from public office, forced into retirement, and twice imprisoned (1934 and 1944) in concentration camps (*see* NATIONAL SOCIALISM) At the end of World War II he rose to leadership of the Christian Democratic Union. He was chairman in 1948 of the convention empowered to draft a provisional constitution for West Germany In September, 1949, following the establishment of the Federal Republic of Germany, he was elected chancellor, he served continuously in that post until October, 1963, when he resigned. From 1951 to 1955 he served also as foreign minister In this dual role he figured decisively in the protracted negotiations which led to the establishment of the Federal Republic of Germany as a sovereign state in May, 1955, and the admission of the republic to the North Atlantic Treaty Organization and the Western European Union (qq v) He is the author of *Erinnerungen* (1965, Eng trans , *Memoirs 1945–53,* 1966) *See also* GERMANY *History*

Konrad Adenauer, leader of postwar Germany, at a reception in Bonn on the eve of his 90th birthday UPI

ADENOIDS, lymphoid tissue at the back of the throat, which usually shrinks and disappears by adolescence Enlargement of this tissue, however, is fairly common in children and may interfere with breathing Symptoms of enlarged adenoids include a nasal voice, persistent breathing through the mouth, snoring, and restless sleeping Adenoid sufferers may experience general listlessness and poor appetite The en-



Location of the Adenoids

larged tissue becomes infected easily, causing respiratory illnesses such as laryngitis and bronchitis (q v) The treatment most often recommended in such cases is surgical removal of the adenoid tissue

ADHESION, attraction between the surfaces of two bodies The term sometimes is used to denote the tendency of two adjacent surfaces, which may be of different chemical composition, to cling to each other, whereas cohesion is used to refer to the attraction between portions of a single body For example, if a sheet of glass is lowered into water and withdrawn, some water will cling to the glass (adhesion) but the rest will be pulled back into the main body of water (cohesion)

The force of attraction is attributed to electromagnetic interactions produced by fluctuations in the distribution of electrons in the molecules of the facing surfaces. The distance between the molecules of the facing surfaces is a determining factor in the amount of force exerted A surface which may appear smooth to the naked eye actually may be too rough to hold its molecules close enough to a facing surface to produce an electromagnetic bond

Cleanliness of the surfaces, temperature, and the pressure applied to the bodies also affect adhesive qualities Two smooth, clean pieces of soft aluminum can be hammered together But if the clean surfaces are touched by the fingers, adhesion will not occur between the pieces of metal Gauge blocks, pieces of metal used for taking accurate measurements, have such extremely smooth surfaces that their facing surfaces can be made to stick to each other by twisting them together

In the human body, when tissues or organs that are normally separated unite or grow together, the process is called adhesion. This abnormal occurrence may come about in the healing process after a surgical operation or take place as a result of an inflammation An example is the adhesion of lung tissue to the chest wall following pleurisy

ADHESIVE, substance used to bond two or more surfaces together. Most adhesives produce a bond by filling in the pits or valleys in the normally rough surfaces. The effectiveness depends upon the surface tension of the adhesive, softness, rate of shrinkage, and other factors Surface tension determines how far the adhesive penetrates the tiny depressions in the surfaces Strains may develop as the adhesive shrinks while drying Surfaces tend gradually to slip over each other if the adhesive remains soft

Adhesives are of organic or inorganic origin, composed of protein materials, gums, starches, cellulose, natural and synthetic resins, rubber, and mineral products, such as sodium silicate (water glass) Of increasing commercial importance are the epoxy resins, which contain short chains of molecules of carbon and oxygen atoms When treated with a curing agent, the short molecules form long chains, or polymers The long chains, though microscopic, become very strong ropes and nets, linking surfaces in a firm bond Epoxy resins have been used to hold together high-tension metallic parts of supersonic aircraft, thereby eliminating the need for rivets

ADIGE, river of N Italy It rises in Rhaetian Alps, flows E as far as Bolzano, and then courses in a generally S direction through Trento and Verona Beyond Verona it flows toward the SE and E, finally emptying into the Adriatic Sea The lower course is wide, but the swift current makes navigation difficult In ancient times the lower course of the river, then known as the Athesis, was somewhat to the N of the present course The river is about 220 mi long

ADIPOSE TISSUE. *See* OBESITY

ADIRONDACK MOUNTAINS *or* **ADIRONDACKS,** group of mountains in N E New York State, bounded by the Canadian border on the N, the Mohawk R Valley on the S, the Saint Lawrence R and Black R valleys on the W and the Lake Champlain area on the E The mountains lie chiefly in Clinton, Essex, Hamilton, and Franklin counties. The Adirondacks are composed mainly of metamorphic and igneous rock, among the oldest in the world (*see* PRECAMBRIAN ERA) Sometimes erroneously included in the Appalachian system (*see* APPALACHIAN MOUNTAINS), the Adirondacks are geologically related to the Canadian Shield (q v) and are generally considered a S. extension of it About one half of the total acreage of the Adirondack Mt range is part of the New York State Forest Preserve Over 2,400,000 acres of forest preserve land have been incorporated into Adirondack Park (created in 1892), where particular conservation and recreation efforts have been focused. The park, which has a total area of 516,000,000 acres (3,200,000 acres in private holdings), occupies the central portion of the mountain range and is magnificently scenic. In the park is Mt. Marcy (5344 ft), the highest summit in the State, as well as forty-five other peaks more than 4000 ft high, among them Algonquin Peak (5114 ft.) and Skylight, Haystack, and Whiteface peaks The region has hundreds of large and small lakes, notably lakes Placid and George, and Schroon, Cranberry, Upper and Lower Saranac, and Raquette lakes.

The Hudson, Ausable, and Black rivers rise in the Adirondacks, and innumerable streams cut through the mountains Adirondack Park is thickly forested with spruce, pine, and hemlock, and with some types of deciduous tree Wildlife is abundant, although some of the larger species are diminishing in number Free campsites on forest preserve land are available to the public

No large cities or major industrial areas are located in the Adirondack Mts The area is a popular all-year sport and resort region Because the climate is beneficial to sufferers from pulmonary ailments, several sanatoriums have been established here A limited amount of lumbering is carried on by private landholders, and some iron ore, talc, and zinc are mined

ADJECTIVE, word that modifies or qualifies a noun or pronoun (qq v.) The six kinds of adjectives are common, participial, pronominal, numeral, proper, and compound

(1) A common adjective is any word that describes a noun, as in the phrases "a *good* horse", "a *strong* horse", "the *eastern* shore", "the *inner* gate"

(2) A participial adjective is the present participle of a verb used to describe a noun, as "an *amusing* story", "a *startling* event"

(3) Pronominal adjectives include demonstrative adjectives ("*this* book", "*that* book"), possessive adjectives ("*his* book", "*their* book"); indefinite adjectives ("*any* book", "*some* book"), and interrogative adjectives ("*Which* book?", "*What* book?")

(4) A numeral adjective is a number used as an adjective, as in "*one* book", "*seven* books", "the *fifth* chapter".

(5) A proper adjective is an adjective formed from a proper name, as in "*Chinese* art", "*Shakespearean* actor"

(6) A compound adjective is one in the attributive position (see below) consisting of two or more hyphenated words, as in "*nut-brown* maiden", "*hard-to-read* book"

An adjective that modifies a noun directly, as in "the *strong* man", "an *amusing* story", "*his* book", is called an attributive adjective An adjective that follows a copulative verb (*see* VERB), as in "the man is *strong*", "the bread tastes *good*", "the story was *his*", is called a predicate adjective

Adjectives express three degrees of comparison positive (*"strong", "beautiful"*), comparative (*"stronger", "more beautiful"*), and superlative (*"strongest", "most beautiful"*).

In many European and various other languages, the form (spelling) of the adjective varies to correspond to the number and gender of the noun or pronoun it modifies, for example, in French, "une femme *âgée*", "un homme *âgé*", "deux femmes *âgées*" In English, however, the adjective does not change its form in any case M P

ADJUTANT, common name for storks of the genus *Leptoptilos*, found in southern Asia and the East Indies (*see* STORK) *L argala* is about 5 ft tall and is found in the East Indies It is chiefly white, but its back and wings are slate-colored, and its head and neck are bare and flesh-colored, marked with black From the front of its neck hangs a long pouch, which is connected with its respiratory system and possibly serves as an air reservoir The adjutant is voracious, and its diet consists of fish, reptiles, carrion, and offal It is an efficient scavenger, and since it also eats many of the smaller noxious animals, it is protected by law in India. The largest species of adjutant, *L dubius*, is about 7 ft. tall and is found in India and southeastern Asia. A smaller species, *L javanicus*, is native to the East Indies A closely allied species, the marabou (q.v), inhabits Africa The long feathers found on the undersides of the tails and wings of all three species are known as marabou when used for trimming ladies' clothing and accessories

ADLER, Alfred (1870–1937), Austrian psychologist and psychiatrist, born in Vienna and educated at the University of Vienna After leaving the university he studied and was associated with the Austrian psychiatrist and founder of psychoanalysis Sigmund Freud (q.v) In 1911

Alfred Adler Bettmann Archive

Adler left the orthodox psychoanalytic school to found a neo-Freudian school of psychoanalysis After 1926 he was often a visiting professor at Columbia University, and in 1935 Adler and his family moved to the United States. In his analysis of individual development, he stressed the sense of inferiority, rather than sexual drives, as the motivating force in human life According to Adler, conscious or subconscious feelings of inferiority (to which he gave the name inferiority complex), combined with compensatory defense mechanisms, are the basic causes of psychopathological behavior The function of the psychoanalyst is to discover and rationalize such feelings and to break down the compensatory, neurotic will to power that they engender in the patient, *see* NIETZSCHE, FRIEDRICH WILHELM For a more detailed discussion of Adler's theories, *see* PSYCHOANALYSIS· *Psychoanalytic Schools Alfred Adler* Adler's works include *The Theory and Practice of Individual Psychology* (1918) and *The Pattern of Life* (1930).

ADLER, Cyrus (1863–1940), American archeologist and educator, born in Van Buren, Ark , and educated at the University of Pennsylvania and at Johns Hopkins University He taught Semitic languages at the latter institution from 1884 to 1893 In 1892 he joined the staff of the Smithsonian Institution as librarian, from 1905 to 1908 he served as assistant secretary He was also curator of historic archeology at the United States National Museum from 1889 to 1908, when he became president of Dropsie College for Hebrew and Cognate Learning, in Philadelphia In 1916 he became acting president, and from 1924 until his death was president, of the Jewish Theological Seminary in New York City. He was the founder (1892) of the Jewish Historical Society of America and editor of the *Jewish Encyclopedia* and the *Jewish Year Book.* Among his works are *The Shofar, Its Use and Origin* (1893), a collection of folktales, *Told in the Coffee House* (1898), *Jews in the Diplomatic Correspondence of the United States* (1906); and *Jacob Henry Schiff* (1921)

ADLER, Felix (1851–1933), educator and reformer, born in Alzey, Germany. In 1857 he came to the United States, where his father had been called to the rabbinate of Temple Emanu-El in New York City After graduating from Columbia College, he studied at the universities of Berlin and Heidelberg. On his return to New York he was appointed professor of Hebrew and Oriental literature at Cornell University, a post he held for two years In 1876 he organized the first Society for Ethical Culture (*see* ETHICAL CULTURE MOVEMENT, THE) In 1880 he founded the Workingman's School, which in 1895 became the Ethical Culture School, and in 1928 he founded the Fieldston School Both schools stress ethics and morality Well known as a lecturer and writer, Adler also was editor of the *International Journal of Ethics* In 1902 Columbia University created the chair of social and political ethics for him, which he kept for the rest of his life He wrote *Creed and Deed* (1877), *Life and Destiny* (1905), *The Religion of Duty* (1912), and *An Ethical Philosophy of Life* (1918)

ADLER, Mortimer Jerome (1902–), American scholar and author, born in New York City, and educated at Columbia University He taught psychology at Columbia University (1923–29) and the philosophy of law at the University of Chicago (1930–52) In 1945 he became associate editor, with the American educator Robert Maynard Hutchins (q v.), of *Great Books of the Western World* (54 vol , 1945–52) He resigned from the University of Chicago in 1952 to head the newly established Institute for Philosophical Research at San Francisco, Calif Adler wrote *How to Read a Book* (1940), *Great Ideas from the Great Books* (1961), and *The Difference of Man and the Difference It Makes* (1967) He was editor in chief of *The Annals of America* (20 vol., 1969), and served as director of planning for the revised *Encyclopaedia Britannica* (15th ed, 1974), known as Britannica 3

ADMETUS. *See* ALCESTIS

ADMINISTRATIVE LAW, body of law applicable to the operations of agencies established by the legislature to carry out the functions of the executive branch of government The Interstate Commerce Commission and the Federal Communications Commission (qq v) are examples of such agencies In the United States and Great Britain the courts did not generally apply a distinctive body of law to such agencies until about the beginning of the 20th century On the European continent, however, the courts had earlier recognized a separate administrative law, which was often known by the French term *droit administratif.* Administrative law in the U S is basically concerned with whether proper standards are applied by administrative agencies in exercising their powers and in making and enforcing regulations If an agency does not apply the proper standards its failure may be redressed by application to the courts. Although a court may not substitute its own judgment for that of the agency in determining whether a given regulation is desirable, the court may declare the regulation a nullity if the agency, by promulgating such a regulation, has exceeded the authority conferred by the legislature In determining that a regulation has been violated, substantial proof is required, but the agency is not bound by the laws of evidence that apply in court trials

With the multiplication of Federal administrative agencies in the U S during the 1930's, a means of making administrative regulations reasonably accessible to the public became necessary The Federal Register Act, enacted in 1935, provides that all Federal regulations must be published in the Federal Register, a regulation that is not published in this manner is not binding upon persons who are unaware of its existence At periodic intervals all Federal regulations still in force must be codified and published in a compilation called the Code of Federal Regulations The Administrative Procedures Act, which was enacted in 1946, provides that before a Federal agency promulgates a general regulation interested parties must be afforded an opportunity to present their views Another safeguard is that the investigation and prosecution of alleged violations may not be undertaken by the same persons who will render the adjudication

ADMINISTRATOR, in law in the United States, the person appointed by a surrogate's court (q v) to administer the estate of a person who dies intestate or leaves a will (q v) that fails to appoint an executor (q v)

ADMIRAL (Ar *amir al,* "lord of the"), in common usage, a naval officer of the highest rank In the United States Navy the rank includes four grades, namely, fleet admiral, admiral, vice-admiral, and rear admiral, in descending order of seniority

Before the American Civil War, the highest rank in the U S Navy was that of commodore In 1862 the rank of rear admiral was created and bestowed on Captain David G Farragut (q v) Congress also established the ranks of vice-admiral and admiral for Farragut in 1864 and 1866, respectively The rank of admiral of the navy was created for the American naval officer George Dewey (q.v) in 1899, on his death the rank was abolished Between 1899 and 1915 the ranks of admiral and vice-admiral were also temporarily abolished During World War II the rank of fleet admiral was created, it was first bestowed upon William Daniel Leahy (q v), on Dec 15, 1944. Within a year it was also bestowed on Ernest Joseph King, Chester William Nimitz, and William Frederick Halsey (qq v) No fleet admirals have been created since World War II

The rank of admiral is held by the chief of naval operations and the commanders in chief of the U S , Atlantic, and Pacific fleets The chief of the Bureau of Naval Personnel holds the rank of vice-admiral, and the chiefs of all other naval bureaus hold the rank of rear admiral If the officers chosen to fill those posts do not already hold the appropriate rank, it is bestowed on them, at least temporarily The rank of admiral can be conferred by Congress as a mark of honor

A system of gradations in the rank of admiral prevails in all major navies of the world In the British navy, except for the substitution of the title admiral of the fleet for that of fleet admiral, the grades are identical to those of the U S Navy

ADMIRALTY 1. In government, the department having control over naval matters The Admiralty Board in Great Britain, established in the early 18th century, manages affairs similar to that of the Department of the Navy in the United States **2.** In law, special court exercising jurisdiction over all maritime issues *See* MARITIME LAW

ADMIRALTY ISLANDS *or* **ADMIRALTIES,** group of islands in the W Pacific Ocean, situated to the N of New Guinea, and comprising, in political geography, the Manus District of the Australian Territory of New Guinea (*see* NEW GUINEA, TERRITORY OF) The Admiralty Islands, which form part of the Bismarck Archipelago (q v), consist of about eighteen islands Manus Island (area, 600 sq mi) and Rambutyo Island (area, about 80 sq mi) are the only large islands of the group Coconut growing and pearl fishing are the leading industries The town of Lorengau, situated at the E extremity of Manus Island, is the administrative center The Admiralties were annexed by Germany in 1885 In 1920, following the defeat of Germany in World War I, the group was mandated to Australia. Japanese forces occupied the islands in 1942, during World War II Early in 1944 an Allied task force invaded the group Japanese resistance ended on March 18, 1944 Area, 800 sq mi , native pop (1970 census) 22,000; nonnative pop (1970) 447

ADMIRALTY LAW. *See* MARITIME LAW

ADOBE, Spanish-American name applied to a sun-dried brick and to the clay soil from which the brick is made Adobe soils are found in the arid and semiarid southwestern portions of the United States and in Mexico Composed of a very fine mixture of quartz, clay, and other minerals, they exhibit great plasticity when moist but when dry are so coherent that tillage is almost impossible The soils cover thousands of square miles in the western U S and under irrigation are very fertile, yielding undiminished yearly harvests of grains, alfalfa, and other crops Combined with straw, adobe soils are molded into bricks which are baked in the sun for from seven to fourteen days Because of the lack of cohesiveness when wet, adobe bricks can be employed only in regions of limited rainfall Dampness causes deterioration, hence adobe structures often have eaves and stone foundations for protection against moisture Such structures are most popularly associated with the Pueblo Indians (q v), who built cliff dwellings and also ovens of adobe Remains of their mud-brick communal villages still stand after centuries, and some Pueblos still live in these unique apartment houses

A similar building material was widely used in ancient Egypt, Babylonia, and Assyria

ADOLESCENCE, process of maturation or state between childhood and adulthood In physiology, the term denotes the period from the beginning of puberty (q v) to maturity, it usually lasts from the age of about fourteen to about twenty-one in males, and from about twelve to about eighteen in females In both sexes the period is marked by maturation of the reproductive organs and by rapid growth, especially in the skeletal and muscular systems and in certain vascular tissues Adolescence is generally characterized by emotional instability, on the one hand, and by emergent emotional and mental maturity, on the other, *see* CHILD PSYCHOLOGY In legal usage, the term is frequently applied to the period prior to full legal age, *see* AGE

ADONAI. *See* GOD; JEHOVAH

ADONIS, genus of annual and perennial herbs in the Crowfoot family (Ranunculaceae), containing six or more species, grown for their showy flowers They attain a height of about 12 in , and have alternate, finely cut leaves, the flowers are usually red in the annual species and yellow in the perennial Spring adonis, *A vernalis,* is a perennial species bearing yellow flowers in May and June Summer adonis, or pheasant's eye, *A aestivalis,* is an annual with crimson flowers blooming from June to August Autumn adonis, or flos adonis, *A. autumnalis,* is an annual; it bears small, dark-centered, red flowers from June through September.

ADONIS, in Greek mythology, beautiful youth beloved by the goddesses Aphrodite and Persephone (qq v). He was born of a myrrh tree and was raised by Persephone When he was slain by a wild boar while hunting, Aphrodite pleaded with the god Zeus (q v) to restore him to her Zeus decreed that Adonis should spend the winter months with Persephone in Hades (q v) and the summer months with Aphrodite

ADOPTION, in law in the United States, the proceedings by which a child not the lawful issue of the adopter is admitted to the legal rights and privileges of a son or daughter In the social life of the Greeks and the Romans adoption played an important part, but it was unknown to the early law of the Teutonic nations Adoption never acquired a place in English law, but most States of the U S have permitted it

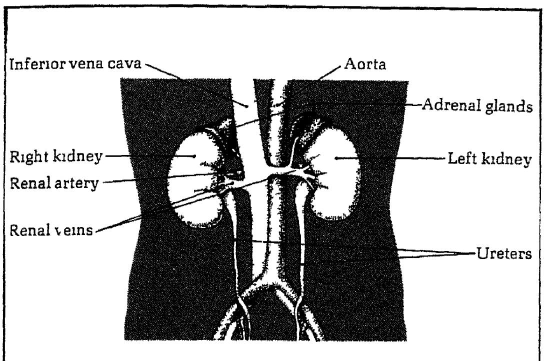
The original purpose of adoption was to prevent the rights of a family from becoming extinct through the failure of natural issue In Rome, adoption was closely associated with the doctrine of paternal power, and assumed two forms. adoption in the strict sense, when one in the power of a natural ascendant was transferred to the power of a third party, and arrogation, when a person legally his own master gave himself into the power of another In the 6th century A D , the Byzantine emperor Justinian I (q v) made radical changes in this as in other departments of law

In the U S the regulations governing adoption vary considerably In some States an order of the court is necessary, whereas in others a deed of adoption is sufficient In all cases, however, the status of the adopted person is substantially that of a child born in lawful wedlock

ADOPTIONISM *or* **ADOPTIANISM,** heresy akin to Nestorianism, originating about the end of the 8th century in Spain (*see* NESTORIANS) Elipandus (717–808?), archbishop of Toledo, and Felix (750?–816), bishop of Urgel, held that, though Christ was Son of God in respect of His divine nature, as man He was only adopted to be the firstborn Son of God. This doctrine gave occasion to three synods, at Ratisbon (792), Frankfort (794), and Aix-la-Chapelle (799), at each of which adoptionism was condemned as heresy.

ADOWA. *See* ADWA

ADRENAL GLAND *or* **SUPRARENAL GLAND,** vital organ situated, in man, near the upper end of each kidney The two parts of the gland, the inner portion or medulla and the outer portion or cortex, are like separate endocrine organs They are composed of different types of tissue and perform different functions The adrenal medulla, composed of chromaffin, secretes the hormone adrenaline (q.v.), also called epinephrine, in response to stimulation of the sympathetic nervous system at times of emotional stress The medulla also secretes the hormone noradrenaline, norepinephrine, or levoartere-



The Location of the Adrenal Glands

nol, which plays a role in maintaining normal blood circulation The hormones of the medulla are called catecholamines Unlike the cortex, the medulla can be removed without endangering the life of an individual

The adrenal cortex, consisting of interrenal tissue, secretes a number of steroid hormones, but only a few are secreted in physiologically significant amounts They are the glucocorticoids, known as cortisone and hydrocortisone, which affect the metabolism of carbohydrates and proteins, a mineralocorticoid, aldosterone, which is essential to the sodium balance and fluid level of the body, and adrenal sex steroids, which have a minor influence on the reproductive system Modified glucocorticoids are now produced synthetically which are superior to naturally secreted steroids for treatment of Addison's disease (q v) and other disorders *See* ACTH, CORTISONE, HORMONES

ADRENALINE *or* **EPINEPHRINE,** hormone secreted by the medulla of the adrenal gland (q v) The pure compound, first isolated by the Japanese chemist Jokichi Takamine (1854–1922), is a white or light-brown crystalline powder of bitter taste which decomposes when heated to about 210° C (410° F) It is 3,4-dihydroxy-α (methylaminoethyl) benzyl alcohol $C_9H_{13}No_3$ The chemical, also known by the trade names Adrenalin and Suprarenin, formerly was prepared from beef adrenals but is now made synthetically

Adrenaline is not necessary to the maintenance of life and is normally present in the bloodstream in minute quantities, in times of excitement or emotional stress, large additional quantities are secreted, exerting a marked effect on body structures in preparation for physical exertion For example, adrenaline stimulates the heart, constricts the small blood vessels, raises the blood pressure, liberates sugar stored in the liver, relaxes certain involuntary muscles and contracts others It is widely used as a drug to stimulate the heart, prevent bleeding, and to counteract allergic conditions such as asthma and hives

The adrenal medulla cells also secrete a substance chemically related to adrenaline, called noradrenaline, norepinephrine, or levoarterenol The presence of noradrenaline, isolated in 1946 by the Swedish scientist Ulf Svante von Euler-Chalpin (q v), had been suspected for nearly fifty years, because secretions of the medulla did not have the same physiological effects as pure adrenaline Noradrenaline is synthesized by the body from the amino acid phenylalanine and is believed to be the precursor of the substance from which adrenaline is produced In adult humans, the proportion of adrenaline is about five times as great as of noradrenaline, but in children and persons with adrenal tumors the proportion is reversed In general the function of noradrenaline seems to be the maintenance of normal blood circulation, the function of adrenaline is to produce dramatic changes in circulation during an emergency For example, noradrenaline constricts blood vessels of the brain and skin but to a lesser degree than adrenaline

ADRIAN, city in Michigan, and county seat of Lenawee Co , on a branch of the Raisin R , about 60 miles s w of Detroit An industrial center in a farm area, Adrian engages in the manufacture of electrical and metal products, wire fencing and cable, scientific equipment, chemicals, food products, and the commercial growing of flowers It is the site of Adrian College (1859, Methodist) and Siena Heights College (1919, Roman Catholic, women) In the vicinity are lake resorts Founded in 1826, Adrian was the western terminus of the earliest railroad west of the Appalachian Mts It was incorporated in 1836, became a county seat in 1838, and a city in 1853 Pop (1960) 20,347, (1970) 20,382

ADRIAN, name of six popes, the most important of whom were the following.

Adrian I (d 795), pope from 772 to 795 He was one of the popes who established the temporal power of the papacy When papal territory was attacked by the Lombard king, Desiderius (756–74), Adrian called Charles, King of the Franks, later the emperor Charlemagne (q v), to his assistance Charles defeated the Lombards, and confirmed the pope in possession of many parts of Italy previously granted by Pepin, father of Charles (*see* PEPIN THE SHORT)

Adrian IV (1100–59), original name NICHOLAS BREAKSPEAR, pope from 1154 to 1159, born in

Langley, England He was the only pope of English birth In 1137 he was made abbot of Saint Rufus After his election to the papacy in 1154, he was called upon by Henry II (q v), King of England, to grant permission for the subjugation of Ireland Since the popes claimed the "islands of the sea" by virtue of the Donation of Constantine, Adrian denied Henry absolute possession, but urged him to occupy the island as a papal fief (*see under* SYLVESTER)

Adrian VI (1459–1523), original name ADRIAN DEDEL, pope from 1522 to 1523, born in Utrecht He was a church and government official in Spain under Charles V (q.v), Holy Roman Emperor In 1520 Charles made him regent of Spain Upon becoming pope, Adrian tried to initiate reforms, especially in regard to indulgences, but was unsuccessful

ADRIAN, Roman Emperor. *See* HADRIAN

ADRIAN, Edgar Douglas, 1st Baron Adrian of Cambridge (1889–1977), British physiologist, born in London and educated at Westminster School and at Trinity College, University of Cambridge. Associated with Cambridge after 1920, he became professor of physiology in 1937 From 1951 to 1965 he was master of Trinity College He also held the posts of vice-chancellor (1957–59) and chancellor (1967) of Cambridge. During 1961 and 1962 he served as president of the Royal Society of Medicine Adrian conducted outstanding research on the functions of the heart and nervous system For his discoveries regarding the functions of neurons he shared the 1932 Nobel Prize in medicine and physiology with the British physiologist Sir Charles Scott Sherrington (q v) In 1955 Adrian was created a baron. His writings include *The Basis of Sensation* (1928), *The Mechanism of Nervous Action* (1932), and *The Physical Background of Perception* (1947)

ADRIANOPLE. *See* EDIRNE

ADRIATIC SEA (anc *Adria* or *Mare Adriaticum*), arm of the Mediterranean Sea, extending in a N W direction, between the E coast of Italy and the W coast of Yugoslavia. At the S extremity is the Strait of Otranto, 45 mi. wide, which connects it with the Ionian Sea (q v) The Gulf of Venice, in the N , and the Gulf of Trieste, in the N E, are the principal Adriatic embayments. The W coast is comparatively low and has few inlets, and the N is marshy and edged with lagoons On the E the Albanian coast is steep and rocky, and the coast of Yugoslavia is fringed with islands The area of the sea is about 60,000 sq mi and the mean depth is about 130 fathoms. The rocky E coasts are dangerous for mariners in the winter because of the prevailing N E. gales (bora) Trieste and Venice, Ancona, Bari, and Brindisi, Italy, are the chief ports The fisheries of the Adriatic are highly productive

ADSORPTION, the attraction between the surface of a solid or liquid, and the atoms, ions, or molecules of a gas or other liquid Porous or finely divided solids can hold more adsorbate because of the relatively large surface area exposed Similarly, the adsorbent surface of a quantity of liquid is increased if the liquid is divided into fine droplets In some cases, the atoms of the adsorbate share electrons with atoms of the adsorbent surface, forming a thin layer of chemical compound Absorption (q v) occurs when the molecules of adsorbate penetrate the bulk of the solid or liquid adsorbent Adsorption frequently is a preliminary step in absorption It is also an important part of catalysis (q v) and other chemical processes *See* COLLOIDAL DISPERSION. DIFFUSION OSMOSIS

ADULT EDUCATION. *See* EDUCATION, ADULT

ADULT EDUCATION ASSOCIATION OF THE U.S.A., organization dedicated to advancing "the concept of education as a process continuing throughout life" It was founded in 1951, absorbing the American Association for Adult Education, which was originated in 1926 by the Carnegie Corporation of New York (q v) The membership is made up of interested individuals, professionals in the field of adult education, organizations, and institutions. The organization encourages local, State, and regional adult-education efforts through twenty-two State and three regional associations. The activities of the association include an annual conference; an information-clearinghouse and consultation service; research studies, and special projects, such as a study of adult education in Latin America for the Agency for International Development, a federal-government agency The association publishes a monthly magazine, a quarterly journal, a newsletter, books, and pamphlets Headquarters are in Washington, D C

ADULTERATION, act of making any commodity impure by admixture of other or baser ingredients. This admixture may corrupt the nature of the original base to the extent of destroying its identity or it may merely lower the value or efficacy of the finished product. The object of adulteration is usually pecuniary profit for the manufacturer, who sells inferior food, drugs, and other products to an unwitting public. Such products, misbranded or labeled as of standard quality, may constitute a grave menace to public health With the advent of pure food and drug laws in Michigan (1895), Wisconsin (1898), Massachusetts (1902), and Minnesota

(1905), there appeared an awakening of interest in the problem of adulteration among consumers In 1906 the Federal government enacted the National Pure Food and Drug Act Within a few years of the passage of the Federal statute, shipping, inspection, and proper branding and labeling laws intended to insure maximum purity were adopted by the remaining States State laws regulating the production and sale of food and drug products within the State widened the scope of the Federal law, which could attack the problem only through the power of Congress to regulate interstate commerce

The Federal Food, Drug and Cosmetic Act of June, 1938, further decreased incentive to adulterate and to defraud Penalties were increased, loopholes in the previous law were eliminated, cosmetics were included among items under Federal control, and regulations regarding interstate traffic in, and labeling of, drugs were made more stringent In 1939 enforcement of the food and drug law, since 1906 under the Department of Agriculture, was placed instead under the Food and Drug Administration (q v)

ADUWA. *See* ADWA

ADVANCEMENT OF SCIENCE, AMERICAN ASSOCIATION FOR THE. *See* AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

ADVENT (Lat *adventus,* "the coming"), in the Christian ecclesiastical calendar, a season of penance observed in preparation for the festival of Christmas (q v) The earliest authentic record of Advent (581 A D) states that the season starts on the feast of Saint Martin (q v), Nov 11, this period is still observed in the Orthodox Church (q v) About 600 Pope Gregory I (*see under* GREGORY) decreed that the season should start on the fourth Sunday before Christmas, but the longer period was observed in England for some years The shorter period is now observed in the Roman Catholic, Lutheran, Anglican, and Protestant Episcopal churches, and the first Sunday of Advent is regarded as the commencement of the Christian ecclesiastical year, *see* CHURCH CALENDAR

ADVENTISM, Christian doctrine that the return of Jesus Christ to rule the world is imminent, and the main tenet of certain Protestant denominations, which thus are referred to as Adventist (see *Adventist Churches,* below) This doctrine and its amplifications are derived mainly from the prophetic and apocalyptic texts of Daniel and Revelation (qq v), popular interest in these texts revived spontaneously in both Europe and America in the early 19th century Most members of Adventist denominations hold the premillenarian view that the Second Advent (the return of Christ) will precede the millennial kingdom of God predicted in Rev 20 1–6, as opposed to the postmillenarian view that the kingdom of God will gradually come into being, presumably through social progress, and that Christ will appear after the millennium (q v) In the postmillenarian view, the dates of the millennium can be known only in retrospect, after Christ's coming, *see also* SECOND ADVENT OF CHRIST

Adventism received its clearest definition and most earnest support in the United States under the leadership of William Miller (1782–1849) of Low Hampton, N Y , who had become a Baptist in 1816 He began preaching Adventist doctrines about 1831, and by 1839 he had begun to acquire a following among both the clergy and lay members of various Protestant churches His followers, referred to as Millerites by the press, took the name Adventists in 1844

In that period most Christian theologians were anticipating the end of the present world order with all its evils, but they interpreted the end of this world as a spiritual regeneration of mankind Miller and his followers, however, believed that a fiery conflagration would cleanse the earth, destroying all except the righteous, who would be miraculously saved Basing his computations on Biblical texts, Miller prophesied that the Second Advent would occur between March 21, 1843, and March 21, 1844 The failure of this prediction was called the First Disappointment, and many left the movement Following this, a second date was set, Oct 22, 1844, and of the 50,000 to 100,000 Adventists in the U S at that time, many disposed of their property in anticipation of the Advent The Great Disappointment was recognized on Oct 23, 1844, the movement was ridiculed in the press and elsewhere, and thereafter many Adventists lost faith and returned to their former churches Those remaining held a conference in Albany, N Y , in the spring of 1845, at which they organized the American Millennial Association, dedicated to the main Millerite doctrines, including premillenarianism, the return of Christ in his own person, the resurrection of the dead, and the renewal of the earth as the eternal home of the redeemed

Adventist Churches. The Adventists split into four main bodies, which continue to flourish in the 1970's The Seventh-day Adventists (*see* SEVENTH-DAY ADVENTIST CHURCH), by far the largest single Adventist group both inside and outside the U S trace their origins to the 1840's According to recent statistics, there are more than 3,800,000 Seventh-day Adventists worldwide Affiliated with the church is Andrews University in Berrien Springs, Mich

The Advent Christian Church, first known as the Advent Christian Association and then the Advent Christian Conference, in 1854 began to withdraw gradually from the American Millennial Association, primarily because of a growing dispute over the question of immortality (q v) First organized in 1860 in Salem, Mass , the Advent Christian Church preached a doctrine of "conditional immortality", according to which the dead remain in an unconscious state until the resurrection, which would take place at the Second Advent (after the millennium) Adventists also believe that a divine tribunal will determine rewards and punishments on the Day of Judgment, and that the punishment of the wicked will be complete extinction, rather than eternal suffering in hell The church observes the sacraments of baptism by immersion and the Lord's Supper (q v) Although organized into regional and central groups (the central group is the Advent Christian General Conference of America), each church governs itself independently According to recent statistics, membership in the U S and Canada neared 30,000 The church supports missionary work in Mexico, Malaysia, Japan, India, and the Philippines, it founded Aurora College in Aurora, Ill , the Berkshire Christian College in Lenox, Mass , and two publishing houses In 1964 the Life and Advent Union, founded in 1848, merged with the Advent Christian Church.

The Church of God (Abrahamic Faith) developed from several smaller groups of similar faith (some dating back to 1800), some of them had organized in 1888 under the name of Church of God in Christ Jesus The churches, however, did not function as a unit until 1921, when a national conference was established and the name Church of God of the Abrahamic Faith was adopted The corporate name is Church of God General Conference (Oregon, Ill) Acceptance of the Bible as the supreme standard of the faith results in a literal interpretation of the Biblical references to the kingdom of God, the premillennial coming of Christ is the central belief The members maintain that the dead are merely asleep, at the time of the Advent the righteous will be resurrected on earth and the wicked will be finally destroyed Acceptance of these doctrines, repentance, and purification through baptism by immersion are requirements for admission to the church The individual churches are autonomous and as of 1971 had about 7200 members in the U.S Missionary work is carried on in India, Mexico, and the Philippines.

The Primitive Advent Church is a recent offshoot of the Advent Christian Church, it has about 600 members, all in West Virginia, and its aim is to recover the principles and thought of early Adventism

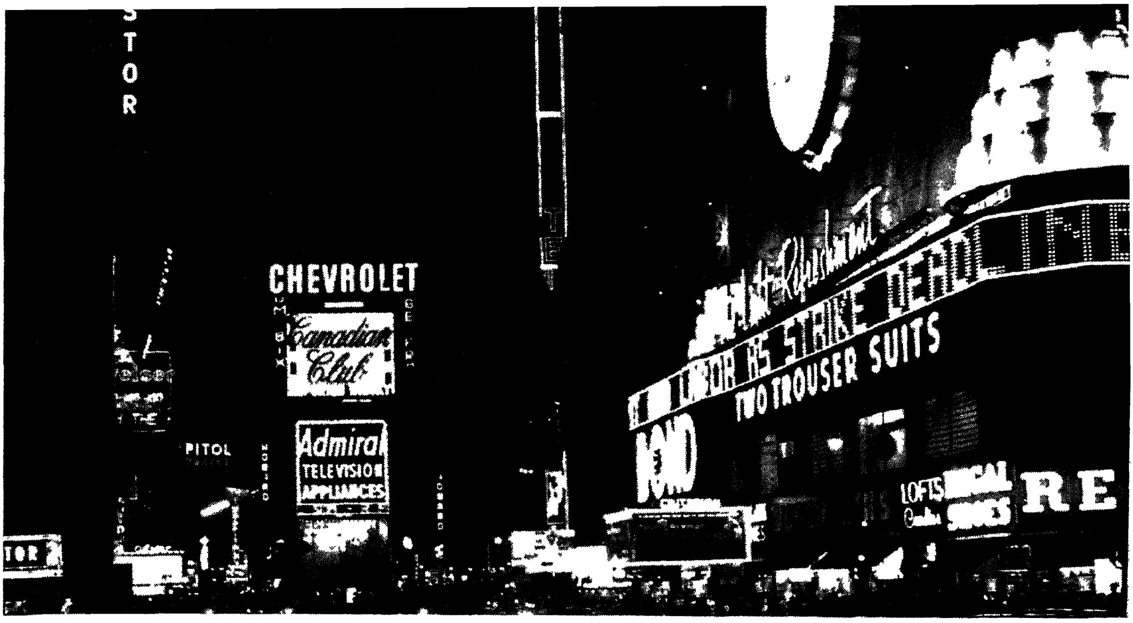
ADVENTIST CHURCH, SEVENTH-DAY. *See* Seventh-Day Adventist Church

ADVERB, part of speech used to modify verbs ("he walked *slowly*"), adjectives ("a *very* good book"), and other adverbs ("he walked *very* slowly") Modification by an adverb is analogous to modification by an adjective Adverbs are subdivided according to their meaning and function into classes indicating (1) place or direction, as *where* and *whence,* (2) time, as *ever* and *immediately,* (3) degree, as *very* and *almost,* (4) manner, as *thus* and *wisely,* and (5) belief or doubt, as *perhaps* and *no* Adverbs and adverbial phrases frequently may express degrees of comparison, namely positive, *wisely,* comparative, *more wisely,* and superlative, *most wisely* In English many adverbs are formed from adjectives by the addition of the suffix -ly, as in *wise, wisely,* in certain other languages, such as French, Spanish, Italian, and Portuguese, similar suffixes are added Some languages, including German and Rumanian, make no distinction in form between the adjective and the adverb, *see* Adjective, Grammar *Parts of Speech,* Verb

ADVERTISING, collective term for public announcements designed to promote the sale of specific commodities or services Advertising is salesmanship on a mass basis, employed when the use of direct, person-to-person selling is impractical, impossible, or simply inefficient It is to be distinguished from other activities intended to persuade the public, such as propaganda (q.v.), publicity, and public relations Advertising techniques range in complexity from the publishing of simple, straightforward notices in the classified-advertising columns of newspapers to the concerted use of newspapers, magazines, television, radio, direct mail, and other communications media, in the course of a single advertising campaign.

From its crude beginnings in ancient times, advertising has burgeoned into a worldwide industry. In the United States in 1972 advertisers invested an estimated $22,800,000,000 in advertising to influence the purchase of commodities and services, a 10 percent increase over their 1971 investment.

American advertising leads the world, not only in volume of business but in the complexity of its organization and of its procedures For these reasons, this article deals primarily with advertising in the U.S. Modern advertising is an



Advertising on a large scale, making use of neon lighting and huge billboards, has been a continuing feature not only of Times Square in New York City but of downtown areas throughout the U S UPI

integral segment of urban industrial civilization, mirroring contemporary life in its best and worst aspects Having proven its force in the movement of economic goods and services, an increasing proportion of recent advertising has been concerned with improving the human condition The 1960's in particular were an era of social concern in advertising The continuing cancer and human-rights campaigns are only two examples of the use of the advertising industry as a means to promote public welfare

Advertising falls into two main categories, namely, consumer advertising, directed to the ultimate purchaser, and trade advertising, in which the appeal is made to dealers and other middlemen through trade journals and other media

Both consumer and trade advertising employ many specialized types of commercial persuasion A relatively minor, but important, form of advertising is institutional advertising, which is designed solely to build prestige and public respect for particular business concerns as important American institutions Each year millions of dollars are spent on institutional advertising, which usually mentions products or services for sale, only incidentally. Another minor, but increasingly popular, form of advertising is cooperative advertising, in which the manufacturer shares the expense of local radio or newspaper advertising with the retailer who signs the advertisement Occasionally national advertisers share the same space in magazine advertising For example, makers of pancake flour, of sirup, and of sausages sometimes jointly advertise this combination as an ideal cold-weather breakfast

Advertising may be local, national, or international in scope The rates charged for the three different levels of advertising vary sharply, particularly in newspapers, special varying rates are set also by newspapers for amusement, legal, political, financial, religious, and charitable advertisements

Media. The channels or media through which advertising messages are disseminated are numerous and varied In descending order of dollar volume, the major media in the U S are newspapers, television, direct mail, outdoor and transit, magazines, radio, and business periodicals In addition, a significant amount of all U S. advertising dollars is invested in dozens of miscellaneous media, such as window displays, free shopping-news publications, calendars, skywriting by airplane, and sandwich boards carried by men walking streets

In the U S. a wide range of advertising media has been developed from sources the potential importance of which was ignored for many years Delivery trucks, once plainly painted, now carry institutional or product messages, as do many shipping cartons Many packages carry advertising for products other than those contained in them, and wrapping paper and carry-out bags bearing advertisements are used widely by retail stores.

Newspapers have traditionally led all other media in the U S in terms of dollars invested in advertising, despite the introduction of the new electronic media (radio and television), the daily papers have maintained a comfortable lead Thus, in 1972 newspapers received about 23 percent of the advertising investments in the nation, totaling $5,400,000,000 from local and national advertisers In volume of space used, classified advertising, known popularly as want ads, amounted to 27 percent of total newspaper advertising In second place was television, with about 13 percent, or $3,000,000,000 More than $2,800,000,000 was invested in direct mail. Radio received about $1,300,000,000, and consumer magazines received about $1,000,000,000

DIRECT ADVERTISING This type of advertising includes all forms of sales appeals mailed, delivered, or exhibited directly to the prospective buyer of an advertised product or service, without use of any indirect medium, such as newspapers or television Direct advertising logically may be divided into three broad classifications, namely direct-mail advertising, mail-order advertising, and unmailed direct advertising.

Direct-Mail Advertising All forms of sales appeals (except mail-order appeals) that are sent through the mails are considered to be direct-mail advertising The chief functions of direct-mail advertising are to familiarize prospective buyers with a product, its name, its maker, and its merits, and with the product's local distributors The direct-mail appeal is designed also to support the sales activities of retailers by encouraging the continued patronage of both old and new customers

Mail-Order Advertising When no personal salesmanship is involved, other methods are needed to induce people to send in orders by mail In addition to newspaper, magazine, radio, and television, special devices, such as single-product folders or multiproduct mammoth catalogs are used Mail-order promotions are designed to accomplish a complete selling job without the help of salesmen Direct-mail advertising helps the salesman, mail-order advertising replaces him

Unmailed Direct Advertising Used for the same broad purposes as direct-mail advertising, it includes all forms of indoor advertising displays and all printed sales appeals distributed from door to door, handed to customers in retail stores, included in packages and bundles of merchandise, or conveyed in some other manner directly to the recipient.

With each medium competing keenly for its share of the business, advertising agencies continued to develop new techniques for displaying and selling wares and services Among these techniques were vastly improved printing and reproduction methods in the graphic field, adapted to magazine advertisements and to direct-mail enclosures, the use of color in newspaper advertisements and in television, and outdoor signboards more attractively designed and efficiently lighted Some of the most subtly effective improvements were suggested by advertising research

Research. During the 19th century it was possible only to approximate the effectiveness of various advertising techniques Prospective advertisers were guided almost solely by estimates of magazine and newspaper readership In the early days of broadcasting and outdoor advertising the industry lacked a reliable measure of the audience of these media In 1914 the Audit Bureau of Circulations (A B C), an independent organization subscribed to principally by newspaper and magazine publishers, was established to meet the need for authentic circulation statistics and for a coordinated, standardized way of presenting them

Eventually, greater scientific efforts to determine relevant facts about audience and readership came about as a result of competition among the media and the demand among advertisers for an accurate means of judging the relative effectiveness of the media The media soon developed ways of ascertaining not only how many people see or hear advertising messages, but what kinds of people and where they are located Newspapers and magazines, either through their own research staffs or through specialized organizations employed for a fee, go to great lengths to analyze their circulations to show where their readers live, their income, education, recreational habits, age, and number of children, and to provide other guides to determining their readers' susceptibility to certain classes of products

Radio and television stations and networks similarly analyze their audiences for the guidance of advertisers. In this field, too, broadcast companies, advertising agencies, and advertisers subscribe to one or more audience-research organizations to determine how many viewers or listeners tune in regional and network shows at any given time. Special surveys of local broadcast programs can be arranged also. In a similar but less comprehensive manner, outdoor- and transportation-advertising companies have set up organizations to tally the numbers of persons exposed to their posters

Because of the nature of advertising, depending as it does on psychological factors and other variable factors difficult to ascertain precisely, the whole field of audience research is complex and controversial. Researchers have found it necessary to consistently refine their techniques and make them increasingly reliable

One by-product of this widespread interest in, and dependence upon, advertising and marketing research is the Advertising Research Foundation, sponsored, directed, and subsidized by advertisers, agencies, and media This organization, founded in 1936, not only initiates and commissions research projects of its own, but also establishes criteria and standards of procedure that tend to enhance the authenticity, reliability, efficiency, and usefulness of all advertising and marketing research

One major type of research project is the survey of test markets Advertisers and agencies frequently conduct extensive and expensive surveys to determine the potential acceptance of products or services before they are advertised nationally at costs that may aggregate millions of dollars In one common procedure the advertising-marketing division of a company dispatches a crew of surveyors to do a door-to-door canvass in various neighborhoods differing in average-income levels Householders are shown various versions of the product intended for market If the survey convinces the manufacturer that one of the versions exhibited will attract enough purchasers, a crew then pretests various sales appeals by showing provisional advertisements to consumers and asking them to indicate their preference After the one or two best-liked advertisements or basic appeals are determined, the advertiser produces a limited quantity of the new product and introduces it in one or more test markets. On the basis of this market test the advertiser-manufacturer can make his final decision as to whether he should invest in a national campaign

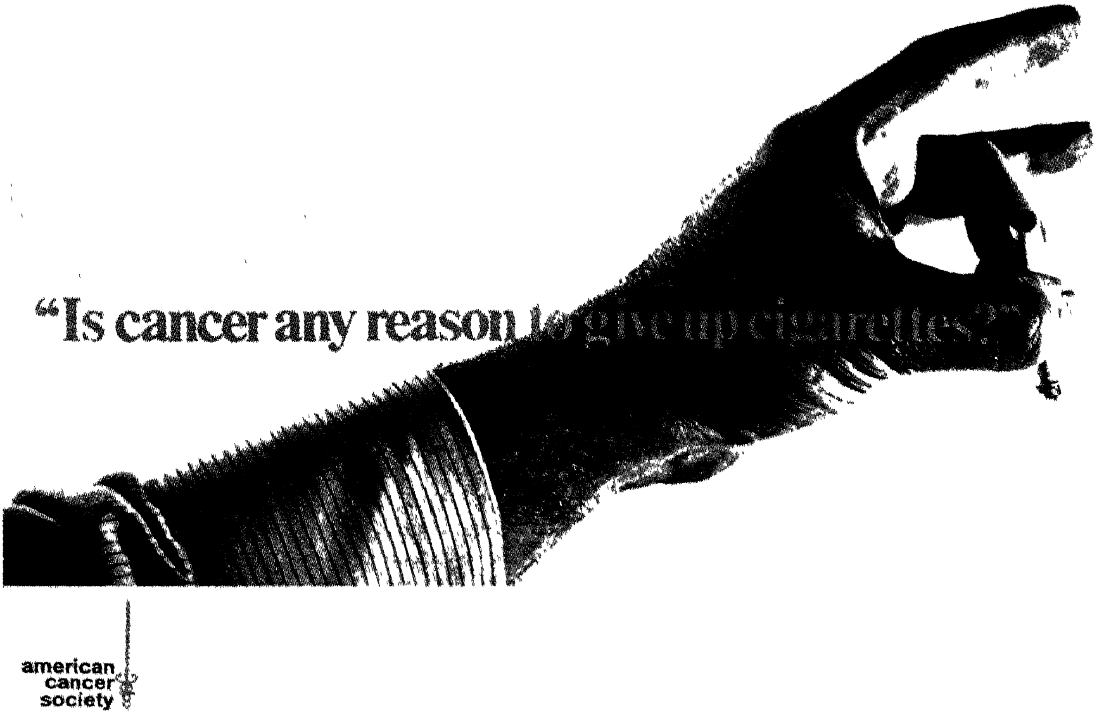
The question of what motivates a consumer to buy challenges the imagination and ingenuity of the seller and presses research specialists forward into new fields of investigation Motivational research, for example, attempts to probe the unconscious impulses that motivate buying decisions, advertising agencies then utilize these findings to influence the consumer and to attempt to break down his sales resistance Critical observers outside the advertising industry assail the motivational approach as unreliable and as unfair to the consumer, who should not, they feel, be subjected to such indirect sales attacks On the other hand, many researchers regard motivational inquiry as nothing new, except that it tends to delve deeper into the psychological springs of behavior than did earlier investigations Through careful questioning and investigation it is often possible for an advertiser to trace a sale and learn what actually motivated the consumer to buy his product. Researchers report that the purchaser is sometimes impelled by factors that he fully understands but does not care to discuss Further, he may be motivated by influences of which he is not even aware Workers in motivational research try to explore these influences

Techniques of Persuasion. While experts argue about new methods, they still rely mainly on basic appeals that have proved successful over the years These appeals offer the hope of more money and better jobs, security against the hazards of old age and illness, popularity and personal prestige, praise from others, more comfort, increased enjoyment, social advancement, improved appearance, and better health The modern advertiser stresses not the product but the benefits that may be enjoyed by purchasers of the product Thus, the advertiser purveys not cosmetics but the expectation of new beauty, allure, and hope To attract the prospective buyer of automobiles, the manufacturer sometimes places less stress on the mechanical attributes of his car than on the excitement, comfort, and prestige it may bring the buyer

The techniques of persuasion are many and are circumscribed only by the ingenuity of the creative mind, by the limits of the various channels of communications, by certain legal restrictions, and by standards self-imposed by the advertising industry One fundamental technique, apparent in the earliest applications of advertising and still basic in the most modern procedures, is repetition A typical national advertiser captures the attention of his prospective customer by repeated appeals to buy It is not unusual for a housewife to get sales talks on her radio and television sets in her home, another one for the same product in her local newspaper, additional reminders in various national magazines, another by outdoor poster or car card on her way to market, and still another when she enters the store and is confronted with an indoor poster, counter card, or display

Another basic persuader is the trademark Manufacturers have spent millions to establish their trademarks as symbols of reliability and value. A trademark is useless, of course, unless the manufacturer sets and maintains high standards of quality, but once consumers gain confidence in it, the owner can use it as a persuader, that is, as a device to reassure customers that all products bearing this symbol are reliable The trademark is especially useful when the manufacturer introduces a new item to his line of goods.

Price appeal probably motivates more decisions to buy than any other appeal, and the magic words "sale" and "bargain" are directed


"Is cancer any reason to give up cigarettes?"
american cancer society

American Cancer Society

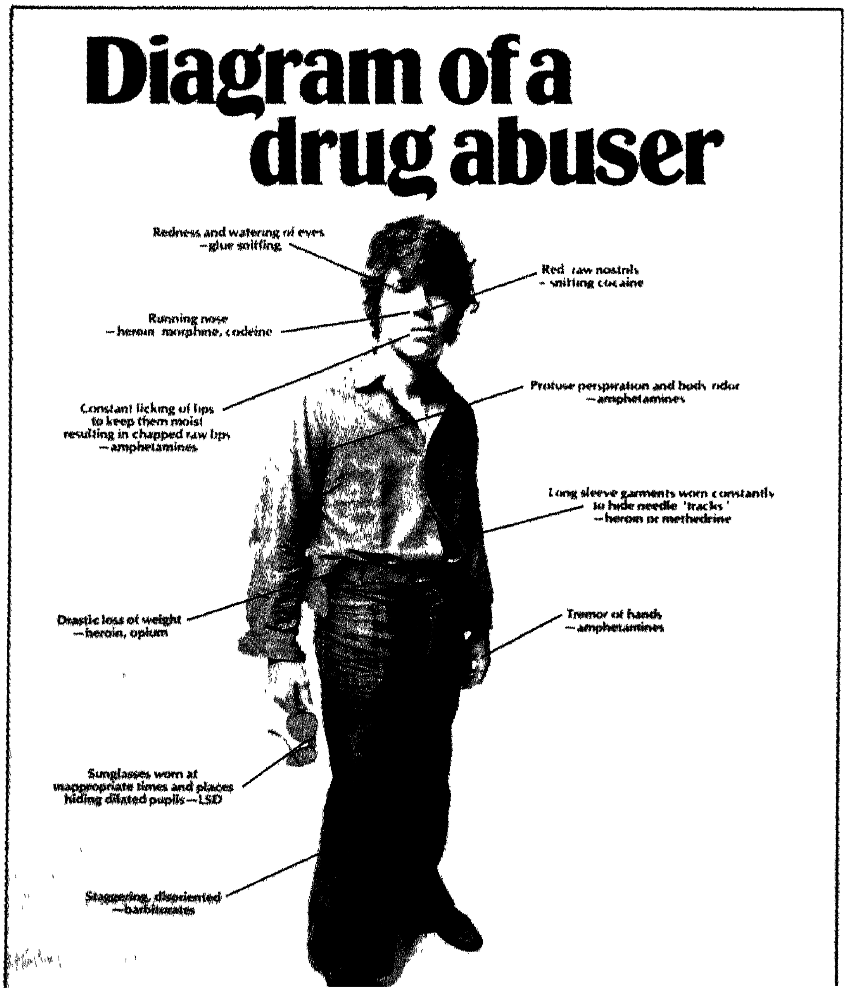


Diagram of a drug abuser
Redness and watering of eyes —glue sniffing
Red, raw nostrils — sniffing cocaine
Running nose —heroin, morphine, codeine
Constant licking of lips to keep them moist resulting in chapped raw lips —amphetamines
Profuse perspiration and body odor —amphetamines
Long sleeve garments worn constantly to hide needle 'tracks' —heroin or methedrine
Drastic loss of weight —heroin, opium
Tremor of hands —amphetamines
Sunglasses worn at inappropriate times and places hiding dilated pupils —LSD
Staggering, disoriented —barbiturates

Advertising Council

Advertising serves many functions in a free-market society. Each of these advertisements has its own way of capturing attention, and each has a message. The public-service messages of the American Cancer Society and of the Advertising Council use persuasion to educate the public and to fight such health hazards as cigarette smoking and drug abuse. The messages of the commercial advertisers, on the other hand, frankly attempt to sell their clients' products or services. The television commercials for Alka Seltzer (below) employed a humorous approach that was rapidly picked up by other advertisers and marked many campaigns of the early 1970's

If Avis is out of cars, we'll get you one from our competition.

Somehow we'll put you in a car

We're not proud. We're only No.2.

We'll call everybody in the business (including No.1). If there's a car to be had, we'll get it for you.

At the airport, we'll even lock up our cashbox and walk you over to the competition in person.

All of which may make you wonder just how often all our shiny new Plymouths are on the road.

We have 35,000 cars in this country.

So the day that every one is out is a rare day for Avis. (If you have a reservation, don't give it a second thought.)

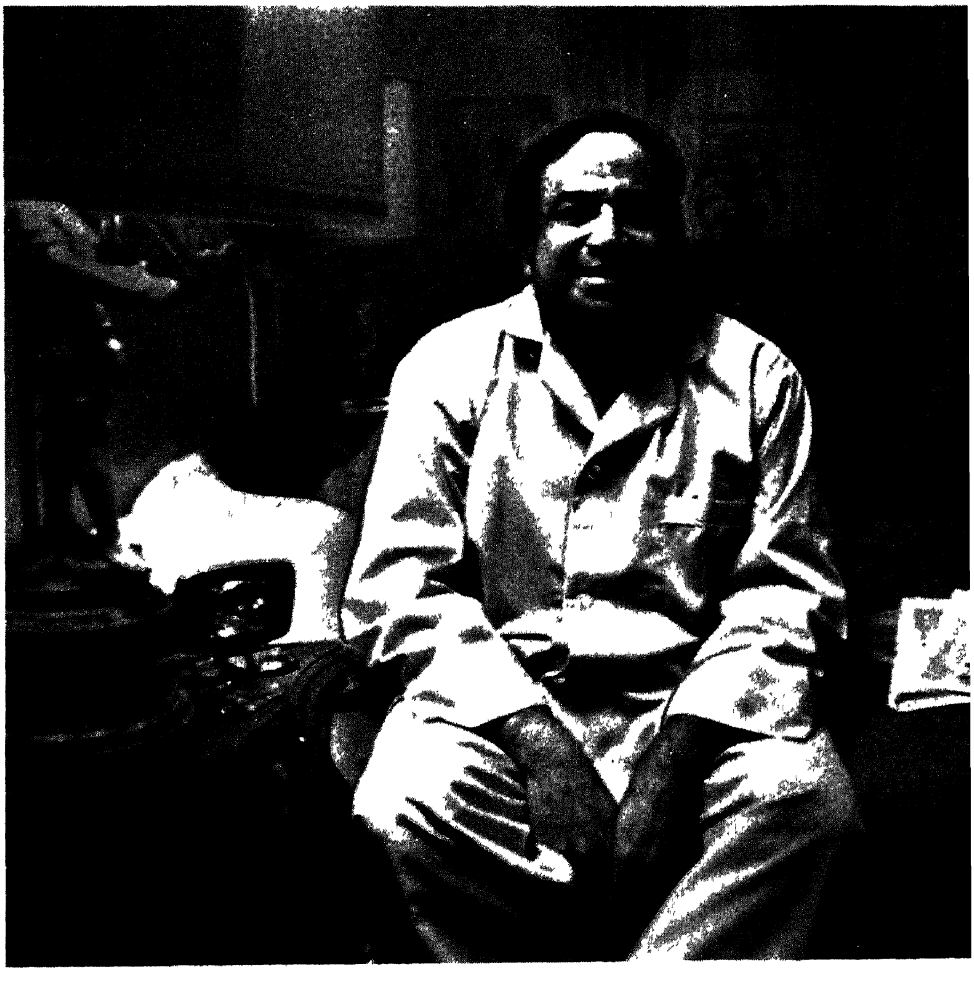
And don't worry about the car our competition will give you.

It's for an Avis customer and they know it.

This is their chance.

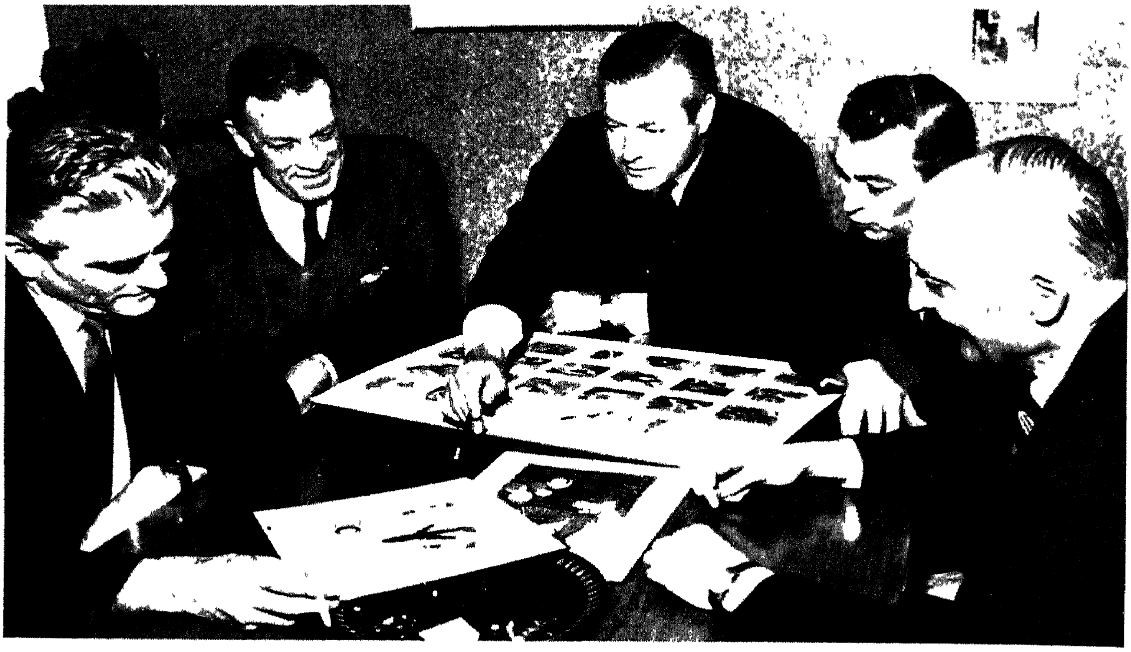
Doyle Dane Bernbach, Inc

Wells Rich Green, Inc



at consumers with great frequency Closely allied to these plain and simple discount offers are the "something for nothing" lures, such as "buy one package and get a second one free", "send for free sample" and "trial offer at half price", and the big-money contest, for example, "finish this sentence and win $10,000 in cash, an automobile, or a trip to Bermuda for two" "No money down" is a successful inducement

Modern advertising employs an astonishing variety of persuaders Among these are humorous and entertaining television and radio com-



Above The first step in the production of a television commercial is the creation by the advertising agency of a "storyboard", which graphically depicts the visual elements of the planned message Filmex

Below During rehearsal the agency director (right) and the film producer explain to the actor the best way to display the product

mercials, appeals to the sense of smell by the use of perfumed ink on paper, endorsements of products by celebrities, appeals to parents to give their children a better life and future, appeals to children to "ask mommy" to buy certain breakfast cereals, and the controversial use of "scare copy" Because fear is a principal human frailty, this last-mentioned motivation is applied to the advertising of thousands of commodities, sometimes boldly, sometimes subtly Fear of poverty, sickness, and loss of social standing, and the specter of possible disasters, great and small, sometimes move previously lethargic and unexcitable consumers to buy anything from insurance and fire extinguishers to cosmetics and vitamin capsules

Structure of the Industry. Big-budget advertising is a relatively new industry Even in the late 1880's there were fewer than a dozen advertisers spending as much as $100,000 a year The advertisers of that period had little need for advertising agents The publishers of magazines and newspapers, however, often found it difficult to sell space in their pages to advertisers, and therefore began to commission brokers to go out and sell advertising space These so-called space brokers were the first advertising agents Present-day advertising agencies continue to act as space brokers in that they purchase space and time on behalf of the advertiser. Their commissions, however, still come from the media owners In fact, the commission, usually 15 percent, represents a major portion of the income of the modern advertising agency Increased costs of operation, however, have obliged many agencies to charge some advertising clients service fees when their revenue from commissions is inadequate It is generally assumed that an agency must now have a gross profit of 20 percent of its total revenue if it is to earn the average industry profit of a little less than 2 percent The fee method of agency compensation has become increasingly important, and is now generally used for such noncommissionable services as research, market analysis, and public relations

Time and space buying is only one of the principal services rendered by the modern advertising agency, although this one department has become highly specialized. The agency spends most of its time planning, creating, and producing the advertising for its clients A typical major agency maintains hundreds of executives and craftsmen. They include advertising and marketing specialists, designers, writers, artists, economists, psychologists, researchers, media analysts, product testers, librarians, accountants and bookkeepers, and mathematicians An important group of people, making up the traffic department, follow and expedite the many pieces of work from start to finish until the completed product is delivered on time at the end of the creative line

The growth of radio and television broadcasting as advertising media necessitated the creation of new departments devoted to the purchase of network- and local-station time, news reports, entertainment shows, and other types of programs The television-radio staff of the agency also supervises the purchase and production of commercial announcements, most of which are produced by independent studios

In the simplest terms the relationship between advertiser and agency may be described as follows The advertiser tells the agent what he wants to sell and at what price. The agency, in consultation with the advertiser, then creates and produces the advertising and recommends the budget, the media to be used, and the scheduling of the various facets of the campaign

The magnitude of such operations in the U S is indicated by the volume of advertising placed and handled by some leading firms in a single year In 1971 the two largest advertisers in the nation, Procter & Gamble Manufacturing Company and Sears Roebuck and Company, each spent more than $200,000,000 to sell their products through newspapers, consumer and other magazines, spot and network radio and television, and outdoor advertising Procter & Gamble, to promote its soaps, detergents, food products, dentifrices, toilet products, and other items, invested about $275,000,000 in advertising. Sears Roebuck, a chain of department stores, spent about $200,000,000 The leading advertising agency was the J Walter Thompson Company, which in 1971 handled accounts totaling $774,000,000 in billings The Interpublic Group of Companies, Inc., the parent of several advertising and public-relations agencies, reported 1971 combined billings of $750,000,000.

Economic and Social Effects. With three million business enterprises using one or more forms of advertising, every American citizen hears or sees advertising from all sides every day of the year, unless he deliberately shuts himself off from this persistent adjunct of modern civilization In the U S the money invested in advertising equaled approximately $100 per capita in 1971 The high per capita cost of U.S. advertising leads many critics to attack it as a wasteful, unnecessary, unreliable, and annoying institution Such critics usually argue that the industry adds unnecessarily to the cost of goods and services promoted by it The proponents of advertising recognize some validity in these criticisms, but in rebuttal point out that by interesting consumers in purchasing commodities, advertising enables manufacturers and others to sell their products in much larger quantities than they would otherwise, the increased volume of sales in turn enables businessmen to sell individual units at lower cost than if they were produced in small quantities

In the opinion of most top business executives and of many economists, modern advertising plays an integral role in the development of markets for the low-cost goods made possible by the high productivity of American industry A recent worldwide study of national investment in advertising, which showed a direct correlation with living standards, supports this thesis

It should be noted also that advertising supplies most of the operating funds of the principal communications media According to a recent authoritative survey, the radio and television industry depends upon advertising for all of its revenue Metropolitan newspapers derive about 70 percent of their income from advertising, and national magazines, some 65 percent An example of the implications of this support is that the Sunday edition of the New York *Times*, if it were to be profitably published on circulation revenue alone, would have to cost $6 to $7 per copy

Regulation. Before the advertising industry became well organized, the sharp and unethical practices of some advertisers prompted the passing of many laws and legal restrictions by the Federal, State, and municipal governments At present, advertising is one of the most strictly regulated industries in the U S A number of Federal bureaus exercise legal powers over advertising An overlapping of authority exists among the bureaus, and in some instances one or more governmental bodies attempt to enforce conflicting regulations The Federal government has failed to develop a coordinated approach to the problems of the industry. The Federal agencies, however, wield considerable influence, mainly by threats of court action or of withdrawal of business licenses from firms accused of unethical practices. In 1969, for example, the Federal Communications Commission (q v), known as the F.C C , began pressing for a ban on the use of broadcast advertising by cigarette companies On March 10, 1970, a bill was passed by the United States Senate prohibiting such cigarette advertising The law became effective in January, 1972

State laws and enforcement bureaus impose additional regulations on certain types of advertising, particularly those involving contests These regulations may differ from State to State Consequently, advertisers planning a national campaign through newspapers may have to prepare several different versions of an advertisement to comply with the varying laws In some States the media are themselves regulated For example, it is illegal in a number of States for radio and television stations to broadcast "hard liquor" advertising, outdoor advertising is banned in certain other States

Despite, or possibly because of, such widespread legal curbs, the advertising industry has resorted to self-regulation in a serious effort to stop abuses before they occur These self-imposed codes of ethics and procedures aim principally to curtail not only bad taste but also misrepresentation and deception in copy and illustrations, as well as derogatory and unfair representations of products of competitors

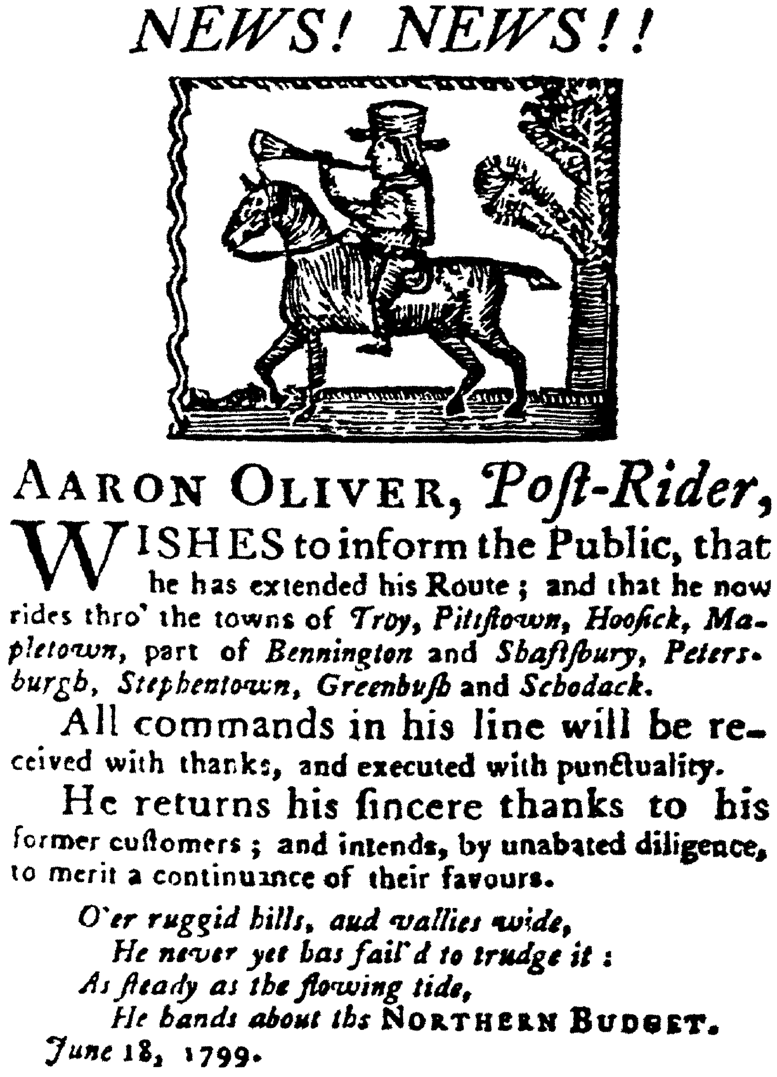
Several advertising trade associations are concerned with maintaining high standards The associations feel it is good public relations to do so, inasmuch as advertising that weakens public confidence damages the impact and influence of all advertising

Individual media and media groups often establish their own codes of ethics Some newspapers and magazines refuse to publish advertising for tobacco and alcoholic beverages, all of them, in varying degree, investigate the reliability of an advertiser before accepting his copy Some publishers have strict rules about the presentation of advertising to prevent the publication of false or exaggerated claims and to preserve the aesthetic tone of their publications

Radio and television stations generally try to investigate the company and its product before broadcasting advertising messages that might cause unfavorable reverberations The networks and the National Association of Broadcasters have established codes regulating the advertising of medical products and controlling contests, premiums, and other offers All the networks maintain so-called acceptance departments, which screen both commercial and noncommercial scripts, either deleting or challenging for substantiation any questionable material Most magazine publishers have their own strict rules on acceptance of advertising copy.

The American Advertising Federation has long campaigned, through its advertising clubs, for "truth in advertising" The Institute of Outdoor Advertising encourages its members to improve the design of their advertising posters and signs

Advertising in the early days of the United States took the form of handbills and personal messages transmitted by the town crier Here a woodcut carries the announcement of a change in route served by a New England post rider Bettmann Archive



NEWS! NEWS!!

AARON OLIVER, *Poſt-Rider,*

WISHES to inform the Public, that he has extended his Route ; and that he now rides thro' the towns of *Troy, Pittſtown, Hooſick, Mapletown,* part of *Bennington* and *Shaftſbury, Petersburgh, Stephentown, Greenbuſh* and *Schodack.*

All commands in his line will be received with thanks, and executed with punctuality.

He returns his ſincere thanks to his former cuſtomers ; and intends, by unabated diligence, to merit a continuance of their favours.

O'er ruggid hills, aud vallies wide,
He never yet has fail'd to trudge it :
As ſteady as the flowing tide,
He hands about the NORTHERN BUDGET.

June 18, 1799.

and, more importantly, to make sure they do not erect advertising billboards in locations where they will mar the landscape or otherwise offend the public The best-known and most active "policemen" in the advertising field are the Better Business Bureaus, which bring pressure to bear on unethical advertisers through persuasion, publicity, or, in extreme cases, legal action The fact that local and national bureaus are subsidized by both advertisers and media reflects the conviction of modern business management that "good advertising is good business"

History. The origins of advertising antedate the Christian era by many centuries One of the first known methods of advertising was the outdoor display, usually an eye-catching sign painted on the wall of a building. Archeologists have uncovered many such signs, notably in the ruins of ancient Rome and Pompeii An outdoor advertisement excavated in Rome offers property for rent, and one found painted on a wall in Pompeii calls the attention of travelers to a tavern situated in another town

In medieval times word-of-mouth praise of products gave rise to a simple but effective form of advertising, the use of public or town criers The criers were strong-lunged citizens who read public notices aloud and were also employed by merchants to shout the praises of their wares Later they became familiar figures on the streets of colonial American settlements. The town criers were forerunners of the modern announcer, who delivers radio and television commercials

Although graphic forms of advertising appeared early in world history, printed advertising made little headway until the invention of the movable-type printing press in Europe about 1440 The trademark, a two- or three-dimensional insignia symbolizing a company or industry, dates from about the 16th century, when tradesmen and guildsmen posted characteristic symbols outside their shops Among the best-known trademarks surviving from early modern times are the striped pole of the barber and the three-ball sign of the pawnbroker

In terms of both volume and technique, advertising made its greatest advances in the U S In the early stages of American advertising nationwide promotion was impractical because the nation itself was underdevloped and lacked transcontinental transportation, distribution, and communications systems Eventually, however, certain types of manufacturers conceived the idea of bypassing wholesalers and retailers and reaching the consumer through direct advertising, mainly by means of catalogs The pioneers in this field were seed companies and book and pamphlet publishers Mail-order houses appeared on the scene as early as the 1870's To the present day they have continued to expand their businesses through direct-mail-catalog and flyer advertising, although some of the biggest houses sell also through retail outlets

Patent-medicine companies loomed large in newspaper and magazine advertising starting in the late 1870's They found a ready market because doctors and reliable pharmacists were scarce outside the populated areas and the frontiersmen and farmers had to do much of their own doctoring The patent-medicine bottlers made a gross profit of from 80 to 90 percent and could therefore well afford to spend money publicizing their remedies

Railroads and steamship lines also were among the early users of advertising in the U.S , not only to praise the luxury and comfort of their modes of travel but also to publish their schedules and rates.

Late in the 19th century many American firms began to market packaged goods under brand names This development initiated a new era in the history of advertising Previously, such everyday household products as sugar, soap, rice, molasses, butter, milk, lard, beans, candy, candles, and pickles had been sold in neighborhood stores from large bulk containers As a result, consumers had seldom been aware of, or influenced by, brand names.

The soapmakers were early advertisers of packaged and branded products. The first "household name" soap brands, which date from about 1880, include Ivory, Pears', Sapolio, Colgate, Kirk's American Family, and Packer's. Soon afterward such brands as Royal Baking Powder, Quaker Oats, Baker's Chocolate, Hire's Root Beer, Regal Shoes, and Waterman's Pens were nationally advertised Shortly after the turn of the century Americans began to be aware of such brand names as Bon Ami, Wrigley, and Coca-Cola.

After World War I advertising developed into a business so big that it became almost a trademark of America itself in the eyes of the world This expansion was stimulated by many technical improvements, and the expanding American industry inspired innovations and improved techniques that benefited other facets of business in the nation

The invention of electricity led to the illuminated outdoor poster, photoengraving and other modern printing inventions helped both the editorial and advertising departments of printed journals Advertising was used increasingly by public-relations specialists as an important means of communication The advent of radio in the 1920's stimulated a whole new technique of selling by voice

During World War II the American advertising industry founded the War Advertising Council, a nonprofit public-service organization that employed the resources of modern advertising to strengthen the American war effort After the war the organization continued, as The Advertising Council, to function in the public interest It has conducted, for example, nationwide drives to increase the sale of United States Savings Bonds, prevent forest fires and traffic accidents, promote religion, and encourage aid to higher education Print and broadcast media contributed in excess of $468,000,000 worth of advertising time and space to such projects during the calendar year of 1971 Twenty-six advertising agencies contributed their creative services to all the council campaigns

The most significant postwar development was the advent of television, a medium which forced the advertising industry to better its techniques of selling by the use of visual devices as well as by voice. E A DeW

ADVOCATE (Lat *advocatus,* "one called to aid"), in a general sense, one who pleads for another in a court of law or other tribunal In Great Britain, professional advocates are called barristers and are permitted to plead or argue cases before the High Court of Justice; a barrister is distinguished from a solicitor, who may conduct litigation only in inferior courts (*see* COURTS *History*) The *avocat* and *avoué* in France are analogous to the barrister and solicitor in England In the United States, most British colonies, and some parts of Europe, the two branches of the legal profession are not separate In a narrower sense, the term advocate was formerly used in Great Britain to denote a member of the College of Advocates at Doctors' Commons (abolished in 1857) These advocates had the exclusive right to plead in the ecclesiastical and admiralty courts, and took precedence of all ordinary barristers In the United States Army, the judge advocate general is chief adviser to the army authorities in the administration of military law, *see* MILITARY COURTS

ADVOCATUS DIABOLI (Lat , "devil's advocate"), in the Roman Catholic Church, name given to the person appointed to state the objections to any proposed canonization The *advocatus Dei* ("God's advocate") undertakes the defense *See* CANONIZATION

ADWA *or* **ADUWA** *or* **ADOWA,** town of Ethiopia, in Tigre Province, about 80 miles S of Asmara The town lies in a fertile agrarian region, more than 6000 ft above sea level, and is a busy trading center, with roads extending to Addis Ababa, Gondars, and Asmara Cotton cloth, brassware, and iron products are manufactured in the town. On March 1, 1896, Adwa was the scene of a decisive Ethiopian victory over an invading Italian army Italian forces severely bombed and subsequently captured the town during the early stages of the Italo-Ethiopian War (1935–36) In 1941, during World War II, the Italian troops were expelled by British and Ethiopian forces, *see* ETHIOPIA. *History* Pop. (1970 est.) 15,712

ADYGEY AUTONOMOUS OBLAST, administrative division of the Soviet Union, in the Russian S F S R , in the Krasnodar Territory. The oblast is on the E shore of the Black Sea in the N W foothills of the Caucasus Mts The population consists largely of Circassians (q v) and Russians Nearly all of the oblast is agricultural land, wheat and maize are the chief crops; cattle breeding is the chief industry Other important industries include food processing, timber, and woodworking Engineering is another rapidly expanding industry, particularly in the capital city of Maykop The oblast was formed in 1922. Area, 2934 sq.mi., pop (1971 est.) 397,000

ADZHAR AUTONOMOUS SOVIET SOCIALIST REPUBLIC, administrative division of the Soviet Union, in the Georgian S.S R., on the S E shore of the Black Sea, N of Turkey Adzhar is sharply divided into a mountainous E section in which livestock breeding and dairy farming are the chief industries, and a subtropical coastal lowland in which tea, citrus fruits, grapes, bamboo, and eucalyptus are the chief agricultural products The warm climate of the lowlands draws many tourists, and the area has several health resorts Batumi, the administrative and cultural center of Adzhar, is also industrially important Oil refining is the major industry, because the city is the terminus of the pipeline originating in the rich oilfields of Baku (q v) Other industries centered in Batumi include shipbuilding and food and drug manufacturing A portion of Adzhar was ceded to Russia by Turkey in 1829, and the remainder in 1878 It became an autonomous republic in 1921. Area, 1160 sq mi ; pop (1972 est) 322,000

AE, pen name of George William Russell (q v)

AEACUS, in Greek mythology, king of Aíyina (q.v) He was the son of the nymph Aegina, for whom his island kingdom was named, and the god Zeus (q.v.) Hera (q v), queen of the gods, angry with Zeus for his love of Aegina, sent a plague that destroyed most of the Aeginetans Aeacus prayed to his father to change a group of industrious ants into human beings to people his deserted city. Zeus granted his wish, creating a race called the Myrmidons (q v) Aeacus ruled over his people with such justice that after his death he became one of the three judges of the underworld (*see* HADES). He was the father of Peleus and the grandfather of Achilles (qq v.)

AEAEA, in Greek mythology, name of the two islands of the sun One island in the east represented the land of the rising sun, and one in the west the land of the setting sun. On the eastern island dwelt Aeëtes, son of the god Helios (q v.) On the western island lived Circe (q v), daughter of Helios. The eastern island was later identified with the ancient region called Colchis, on the Black Sea, the western, with Circeo, a cape on the Bay of Gaeta in Italy

AEDES, formerly called *Stegomyia,* genus of mosquitoes of the subfamily Culcinae One species, *A aegypti,* which is responsible for the transmission of yellow fever (q.v), is common throughout tropical and subtropical America *Aedes triseriatus,* found throughout eastern United States, is also capable of transmitting yellow fever. Some members of the genus transmit the tropical and subtropical disease dengue (q v), others transmit filariasis, one of the most serious of all tropical diseases (*see* FILARIA) *Aedes* mosquitoes are striped on both body and legs Only females suck blood, and they bite during the day rather than at night *See* MOSQUITO

AEDILES, officers of the Roman Republic, corresponding approximately to directors of public works and exercising some police powers The aediles supervised the maintenance (including fire fighting) and repair of the temples, public buildings, streets, sewers, and aqueducts of the city of Rome, supervised the public markets, regulated weights and measures, directed the public games, and maintained public order

The office was founded in 494 B C with the establishment of two aedileships to be held by members of the plebs (q v), or common people The plebian aediles were elected annually by the plebs themselves In 367 B C two additional aediles, known as curule aediles, were installed in office, the curule aedileships initially were held alternately, year by year, by either patricians (q v) or plebs In 44 B C two more plebian aediles were installed by the Roman dictator Gaius Julius Caesar (q.v), himself a former curule aedile, the new aediles, known as ceriales, had the special function of overseeing the grain supply

Traditionally, the aedileship was the second magistracy, following the quaestorship in the career of Roman politicians; *see* QUAESTOR In the last years of the republic the office was eagerly sought by ambitious politicians because of the opportunity it provided for building a public following Under the Roman Empire the office lost its importance and by the 3rd century A D it had disappeared

AËDON, in Greek mythology, wife of Zethus, King of Thebes She was insanely jealous of her sister-in-law Niobe (q v), who had seven sons while she had only one Attempting to kill Niobe's eldest boy, Aëdon slew her own son by mistake The god Zeus (q v) turned her into a nightingale whose melancholy song is a lament for the murdered child

AEGADIAN ISLES. *See* EGADI ISLANDS.

AEGEAN CIVILIZATION, general term for the culture of Greece and of the Aegean basin in the Bronze Age It is also referred to as Mycenaean and Minoan from the excavations at Mycenae (in present-day Greece) in 1876 and on the island of Crete (ruled by the legendary King Minos) beginning in 1899 The findings drew attention to the highly developed culture of the early inhabitants of these places Later discoveries, notably at Tiryns and Pylos, Greece, and Hissarlik, Turkey, the site of Troy (q v.), during the 20th century indicate that the Aegean culture was widespread during the 2nd millennium B C, and that it had close connections with the contemporary civilizations of Egypt and the Near East In architecture, painting, ceramic and lapidary art, and in the development of a pictographic script identified in 1955 as Greek, these peoples gave evidence of a cultural level which was not to be surpassed for a long time

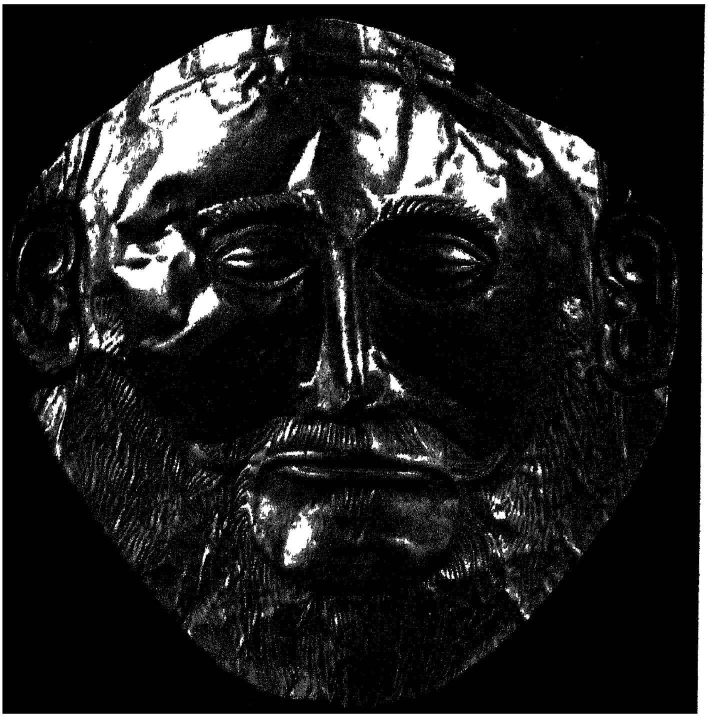
By the 3rd millennium B C most of the later Greek sites had been settled Before this time they had developed agriculture and animal husbandry, used painted pottery, and evolved a technique for making human figures in clay Their houses had solid stone foundations and some were built on the megaron plan, used for the temples of the classical age, of a great rectangular central hall with a circular hearth in the center Walls surrounding some of the villages indicate that the settlers felt a need for protection

By the beginning of the 3rd millennium metals were being used and the Bronze Age had begun, this development continued into the 2nd millennium Villages became larger and more numerous Lerna (in present-day Greece) on the Gulf of Argolis had a large palace at its center, probably the seat of a king or city-ruler like the legendary Greek king Agamemnon (q v) Jars and boxes were secured by individualized seals, showing that the concept of private property had developed

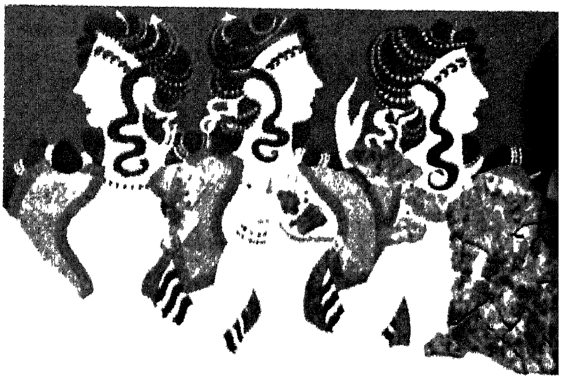
The early phase of the Bronze Age on the mainland ended about 2000 B C with military conquest of the area by invaders from the north The invasion resulted in much destruction, and subsequent architecture, pottery, and tools reveal the influence of the intruders. The most important innovation was the potter's wheel; the later pottery is characterized by a symmetry and refinement of shape that indicate mastery of that device During the next period, known as the Middle Helladic or Middle Minoan Age, the great palaces and fortifications in Mycenae and Tiryns, and in Knossós, Crete, were built. Contacts with other civilizations are evidenced by the appearance in Egypt of the handsome Cretan pottery with its white designs painted on a black background. These contacts make it possible to determine the approximate dates of the subsequent Aegean cultures by reference to Egyptian and western Asian documents with their relatively precise chronology.

The transition to the Late Helladic or Late Minoan Age, beginning about 1600 B C, was gradual and peaceful Palaces, tombs, and fortifications of the period reveal increased skill at large-scale stone construction The shaft graves of Mycenae, actually royal tombs, have yielded vessels and ornaments of gold and silver, engraved gems, copper daggers inlaid with silver, and other objects testifying to the wealth and luxury of the age The pottery is gaily decorated with floral designs, marine scenes, and figures

Aegean Civilization

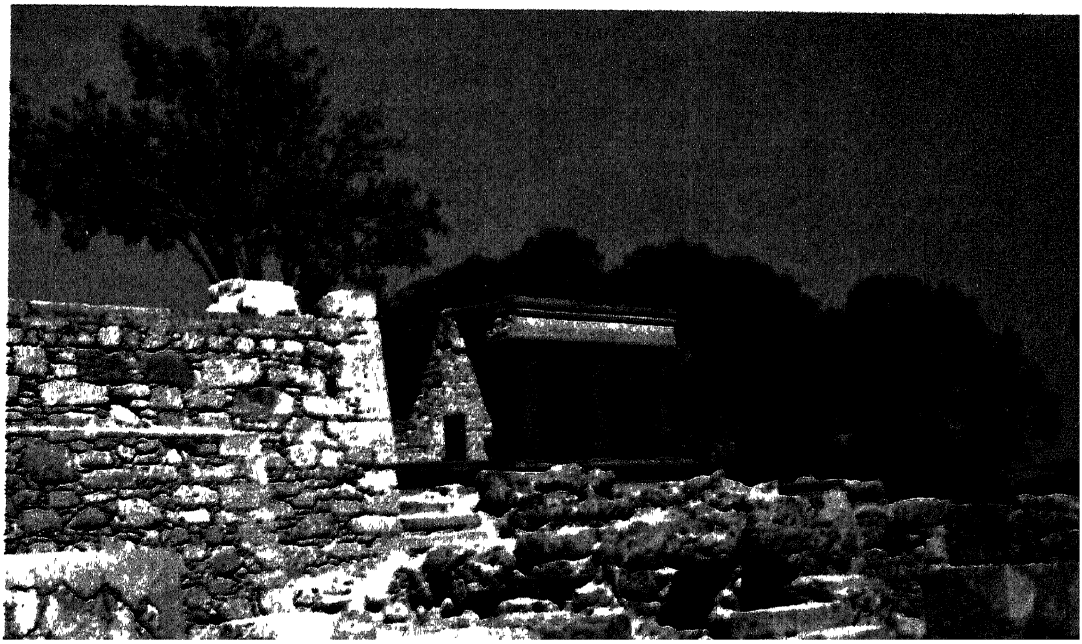


Death mask of hammered gold found in a shaft grave at Mycenae by archeologist Heinrich Schliemann
National Museum, Athens



Right "Ladies in Blue," part of a fresco from the palace of Knossos in Crete The hairstyle, dress, and curving lines are typical of Cretan art Below the ruins of the labyrinthine palace of King Minos, in Knossos, reveal the tapered columns that enhanced the architecture of ancient Crete **Greek National Tourist Office**

Ashak Rawji



of men and animals engaged in warfare and hunting The metalwork and the frescoes, especially those of the great palace at Knossós, later known by Greeks as the Labyrinth, present a revealing picture of religious ceremonials and other activities Objects of Cretan manufacture were exported to the Greek mainland and to Egypt

The flourishing life of Knossós was cut off early in the fifteenth century B C, when the unfortified city was captured and burned A Greek occupation followed, as is proved by the many tablets in Greek written in the Linear B script, similar to those found later in Pylos and Mycenae (*see* GREEK LANGUAGE) From about 1400 to 1200 B C Mycenaean Greece came to dominate the commerce of the eastern Mediterranean Sea, and Greek colonies were planted in Cyprus and Syria, as well as southern Italy and Sicily

This thriving society collapsed in the 12th century B C when much of Greece was laid waste by an invasion of unknown origin, but probably connected in some still undetermined way with the siege of Troy. *See also* ARCHEOLOGY. *History;* ART *History Greek Art,* MINOAN CULTURE, MYCENAEAN ART AND ARCHITECTURE.

AEGEAN ISLANDS, numerous islands in the Aegean Sea between Greece and Asia Minor The chief islands are Euboea (which is by far the largest and adjoins the mainland of Greece), Thásos, Samothráki, Lésvos, Limnos, Kos, Khíos, and Sámos All the islands are included in either the Sporades or the Cyclades (qq v.) groups The islands, many of which are of volcanic origin, have a healthful climate and beautiful scenery In ancient times they played an important part in the course of Greek history, giving to the world many distinguished poets and philosophers The islands came under the control of Rome in the 2nd century B.C., and from the 5th to the 13th century A D were part of the Byzantine Empire During the 15th and 16th centuries the islands were conquered by Turkey, and they remained under Turkish rule until 1829, when most of them became part of the independent kingdom of Greece. Since that time they have remained under Greek possession except for two short periods From 1911 to 1912, twelve of the Sporades, then still under Turkish rule, were held by Italy during the Italo-Turkish War (*see* TURKEY. *History*), and during World War II, from 1941 to 1944, Greece was under the control of the Axis powers (q.v.).

AEGEAN SEA, also known as ARCHIPELAGO, arm of the Mediterranean Sea between Greece and Asia Minor. The name is variously explained in writings of antiquity as derived from Aegeus, King of Athens and father of Theseus (q v), or from Aegea, a queen of the Amazons who drowned in the sea, or from an ancient Greek town named Aegae The Aegean Sea is about 400 mi. long and 180 mi wide. It is connected with the Sea of Marmara to the N E by the Strait of the Dardanelles The Aegean Sea is irregular in outline, with numerous gulfs, and is studded with islands (*see* AEGEAN ISLANDS) At the beginning of recorded history, the Aegean Sea was the center of one of the earliest known European civilizations (*see* AEGEAN CIVILIZATION) With the rise of the ancient Greek and Near Eastern cultures, the lands surrounding the sea became the sites of widely differing civilizations, and the culture of the Aegean islands became identified with that of Greece

AEGEUS. *See* THESEUS

AEGINA. *See* AÍYINA.

AEGIR, in Norse mythology, god of stormy seas. His wife, Ran, wrecks ships and draws mariners to the depths of the sea The nine daughters of Aegir and Ran represent the different appearances of the waves of the sea

AEGIS. *See* ZEUS

AEGISTHUS, in Greek mythology, the son of Thyestes (q v) and his daughter Pelopia. Desiring to avenge himself upon his brother Atreus (q.v.) and acting on the advice of the oracle at Delphi, Thyestes consummated an incestuous union with Pelopia. Shortly afterward, Atreus married Pelopia, not knowing she was his niece When Aegisthus was born, Atreus accepted him as his own son. Aegisthus later learned his true identity and, urged on by Thyestes, killed Atreus. While Agamemnon (q v.), King of Mycenae, was away fighting in the Trojan War (q.v), Aegisthus became the lover of Queen Clytemnestra (q.v.). He helped Clytemnestra kill her husband upon his return from Troy (q v.) With the queen Aegisthus then ruled Mycenae for seven years; he was murdered by Agamemnon's son Orestes (q.v.). *See* ATREUS, HOUSE OF

AEGIUM, in ancient geography, town in Achaea, in Greece, W. of the mouth of the Selinus R. and according to one legend, the birthplace of Zeus (q.v.), father of the gods After an earthquake destroyed Helice (373 B C), Aegium became the chief city of the Achaean League (q v.), and the delegates of the league had their place of meeting in a grove near the town. The modern town is known as Aigion or Aegium

AEGYPTUS, in Greek mythology, king of Arabia and Egypt, which he conquered and named for himself. He was the twin brother of Danaüs (q v.), who became king of Argos.

AEHRENTHAL, Alois Lexa, Count von (1854–1912), Austro-Hungarian statesman, born in Bohemia, and educated at the universities of Bonn and Prague In 1877 he entered the diplomatic service of Austria-Hungary and, after holding subordinate positions, he was appointed minister to Rumania in 1888 In 1889 he became ambassador to Russia He served in this capacity until 1906, when he was appointed premier and minister of foreign affairs His policies as foreign minister led to the annexation of Bosnia and Hercegovina (now in Yugoslavia) by Austria-Hungary in 1908, an act which had far-reaching repercussions in subsequent European history The annexation is regarded as an important contributory cause of the Balkan Wars (q v) and as an influential, though indirect, cause of World War I Aehrenthal resigned his post in 1912

AEKEN, Hieronymus van. *See* BOSCH, HIERONYMUS

AELFRED. *See* ALFRED

AELFRIC THE GRAMMARIAN (950?–1020?), English abbot and writer His own works are the only source of information on his life About 972, he entered the Benedictine school at Winchester and became a monk In 987 he was summoned to rule over the abbey of Cernel in Dorset, where he taught and preached Afterward, probably in 1006, he was made abbot of Eynsham Aelfric is best known for his *Homilies,* written in Old English Among his other works are *A Treatise on the Old and New Testaments,* the *Heptateuchus,* an abridged translation of the first seven books of the Old Testament; a Latin grammar and glossary, written in English for boys, and the *Colloquium,* which was designed to teach boys to speak Latin correctly On the basis of the last two, Aelfric is accorded the title of grammarian His writings include some of the best examples of Old English prose extant

AELIA CAPITOLINA, name given to the new city built in the 2nd century on the ruins of Jerusalem (q v) by the Roman emperor Hadrian (q v) The city was declared a Roman colony, and Jews were forbidden to enter it The name remained in use until the 4th century A D, the time of the first Christian emperors of Rome

AELURUS, in Egyptian mythology, sacred cat worshiped as a deity and embalmed and buried after its death at Bubastis (q v) According to the Greek historian Herodotus (q v), Aelurus was identified with Artemis (q v), Greek goddess of the hunt

AEMILIAN WAY (Lat *Via Aemiliana*), ancient Roman road, about 175 mi long, built by the consul Marcus Aemilius Lepidus in 187 B C The course lies within present-day Italy. The road ran from Ariminum (now Rimini), northwest to Placentia (now Piacenza), and was later extended northwest across the Po R. to Mediolanum (now Milan) Still later extensions to Augusta Praetoria, to Segusio, and to Aquileia, were also loosely called the Via Aemiliana Today the road follows the same route and even crosses some of the original bridges, and the district between Rimini and Piacenza still retains the name of Emilia, derived from that of the ancient highway

AENEAS, in Roman mythology, the son of Anchises, a Trojan prince, and Venus (q v), goddess of love After the capture of Troy (q v) by the Greeks he was able, with the help of his mother, to escape from the fallen city. Carrying his aged father on his back and leading his little son by the hand, he made his way to the seacoast. In the confusion of flight, his wife was left behind

A long, perilous and adventure-filled voyage took him to Thrace, Delos, Crete, and Sicily, where his father died The goddess Juno (q v), who had always hated Aeneas and wanted to keep him from founding Rome, which she knew he was destined to do, tried to drown him in a violent storm In the storm, he and his crew were cast up on the African coast, where they were welcomed by Dido (q v), the beautiful

Aeneas rescuing his father at the burning of Troy, detail from a work by the Italian Renaissance painter Raphael in the Vatican, Rome Brown Bros

queen of Carthage Dido fell in love with Aeneas and begged him to remain with her When he refused and set sail from Africa, she took her own life in despair

After several years of wandering, Aeneas reached Italy and the mouth of the Tiber; there he was hospitably received by Latinus, the king of Latium (q v) He became betrothed to Lavinia, the daughter of Latinus, but before he could marry her, Juno caused Turnus, the king of the Rutuli and a rejected suitor of Lavinia, to start war against Aeneas and Latinus The war was resolved by hand-to-hand combat, in which Turnus was defeated and slain by Aeneas Aeneas then ruled for several years in Latium and, marrying Lavinia, founded the Roman race

The great Roman epic, the *Aeneid* (q v) by Vergil (q.v), tells the story of Aeneas' perilous wanderings in detail, and ends with the death of Turnus

AENEAS SILVIUS, the name by which Pope Pius II (*see under* PIUS) is frequently known

AENEID, the great national epic of Rome, composed between the years 29 and 19 B C by the poet Publius Vergilius Maro, more familiarly known as Vergil (q v) The epic was left without final revision upon the death of Vergil in 19 B C The *Aeneid* is a mythological work in twelve books, describing the wanderings of the hero Aeneas (q v) and a small band of Trojans after the fall of Troy (*see* TROJAN WAR) Aeneas escaped from Troy with the images of his ancestral gods, carrying his aged father on his shoulders, and leading his young son Ascanius by the hand, but in the confusion of his hasty flight he lost his wife, Creusa. He collected a fleet of twenty vessels, and sailed with the surviving Trojans to Thrace, where they began building a city Aeneas subsequently abandoned his plan of a settlement there and went to Crete, but was driven from that island by a pestilence. After visiting Epirus and Sicily (where his father died), Aeneas was shipwrecked on the coast of Africa and welcomed by Dido (q v), Queen of Carthage After a time he again set sail, Dido, who had fallen in love with him, was heartbroken by his departure and committed suicide. After visiting Sicily again and stopping at Cumae, on the Bay of Naples, he landed at the mouth of the Tiber R , seven years after the fall of Troy. Aeneas was welcomed by Latinus, King of Latium. Lavinia, the daughter of Latinus, was destined to marry a stranger, but her mother Amata had promised to give her in marriage to Turnus, King of the Rutulians A war ensued, which terminated with the defeat and death of Turnus, thus making possible the marriage of Aeneas and Lavinia Aeneas died three years later, and his son Ascanius founded Alba Longa (q v), the mother city of Rome

The *Aeneid* derives its plan of style and treatment primarily from the *Iliad* (q v) and, to a lesser degree, from the *Odyssey* (q v.), the great epics of the Greek poet Homer (q v) Vergil was partly influenced also by the epic poem *Argonautica* by the Greek poet Apollonius of Rhodes (q.v), and the *Annales* of the Roman poet Quintus Ennius (q v), who was the first to introduce dactylic hexameter into Latin epic verse (*see* VERSIFICATION) In the *Aeneid*, Vergil developed both the music and the technical precision of this meter so subtly that his verse ever since has been considered a model of literary perfection The *Aeneid* is usually considered the first great literary epic, in contrast to the *Iliad*, which is constructed with literary artistry but contains a great number of usages and forms found in earlier oral poetry. The *Aeneid*, unlike the *Iliad*, is not an inherited part of a national consciousness, but rather a deliberate attempt to glorify the nation and, particularly, to celebrate the achievements and ideals of the Roman state under its first emperor, Augustus (q v) The historical and Augustan elements are especially prominent in Books 5–8, the central section of the poem

Because of its ambitious design, the smooth beauty of its style, and its tenderness of feeling, the *Aeneid* is regarded as one of the greatest masterpieces of world literature.

The *Aeneid* was highly appreciated in its own day To judge from the fine quality of the numerous manuscripts dating from the 3rd to the 5th century A D , and the numerous references by later Roman writers, the *Aeneid* was popular for a long time after its composition During the Middle Ages philosophical meanings were read into the poem, and Vergil himself was thought to be a seer and a magician

The importance of the *Aeneid* in the history of English poetry has been considerable The English poet Geoffrey Chaucer (q.v.) told part of the story in his *House of Fame* Edmund Spenser (q.v.), in *The Faerie Queene,* was indebted to Vergil for the conception of the epic as a national poem. The style and technique of versification of such English poets as John Milton and Alfred Lord Tennyson (qq.v) were influenced by the Latin of the *Aeneid* The work has been in widespread use as a school text for centuries Notable translations of the poem include those by the English poets John Dryden, William Morris, and C(ecil) D(ay) Lewis (qq v). *See* EPIC POETRY, LATIN LITERATURE

AENESIDEMUS. *See* SKEPTICISM

AEOLIAN HARP, musical instrument consisting of from eight to twelve gut strings stretched over a narrow, oblong box When placed in a current of air, the Aeolian harp produces full chords, composed of the harmonics of a single fundamental tone to which all the strings are tuned The sounds range from pianissimo to forte and die away with the passing of the gust The principle of the Aeolian harp was known in antiquity, similar devices are mentioned in the Old Testament In modern times the instrument is frequently placed in a window or similar aperture

AEOLIANS, one of the three great divisions of the Hellenic stock, tracing their descent from Aeolus (q v) Originally settled in Thessaly, they founded numerous colonies in other parts of Greece In the 11th century B C many of them emigrated to the island of Lésvos in the Aegean Sea, they also founded cities on the west coast of Asia Minor, between the Dardanelles and the Hermus R This region became known as Aeolis The Aeolian dialect is generally recognized as the oldest form of Hellenic speech *See* GREECE *History Ancient Greece,* GREEK LANGUAGE

AEOLUS, in Greek mythology, keeper of the winds He lived on the floating island Aeolia with his six sons and six daughters The god Zeus (q v) had given him the power to regulate the winds, stilling them or arousing them as he wished When the Greek hero Odysseus (*see* ODYSSEY) visited him, Aeolus welcomed him as an honored guest As a parting gift he gave Odysseus a favoring wind and a leather bag in which he had put all the winds. Odysseus' sailors, thinking the bag contained gold, opened it and were at once swept back to Aeolia There Aeolus refused to help them again. *See* ULYSSES

AEOLUS, in Greek mythology, King of Thessaly He was the son of Hellen (q v), ancestor of the Hellenes, the ancient Greek peoples. Aeolus was himself the ancestor of the Aeolian Greeks (*see* AEOLIANS)

AEPYORNIS (Gr , "tall bird"), genus of several fossil birds from the island of Madagascar, especially the "elephant bird" This great bird may have survived until the arrival of the first humans on Madagascar and thus given rise to the legend of the roc, the gigantic mythical bird once believed to have inhabited India and later popularized in the *Arabian Nights* (q v).

The elephant bird was 8 to 9 ft tall and extremely massive, weighing perhaps as much as 1000 lb , by far the heaviest of any known bird Several of its eggs have been found fossilized in the mud of swamps

AERATION, in water purification, the saturation of water with air Water is brought into contact with air in such a manner as to produce maximum diffusion (q v), usually by spraying water into the air in fountains Aeration removes odors and taste caused by decomposing organic matter, and also industrial wastes such as phenols, and volatile gases such as carbon dioxide and chlorine (qq v) It also converts dissolved iron and manganese compounds into insoluble hydrated oxides of the metals which may then be readily settled out

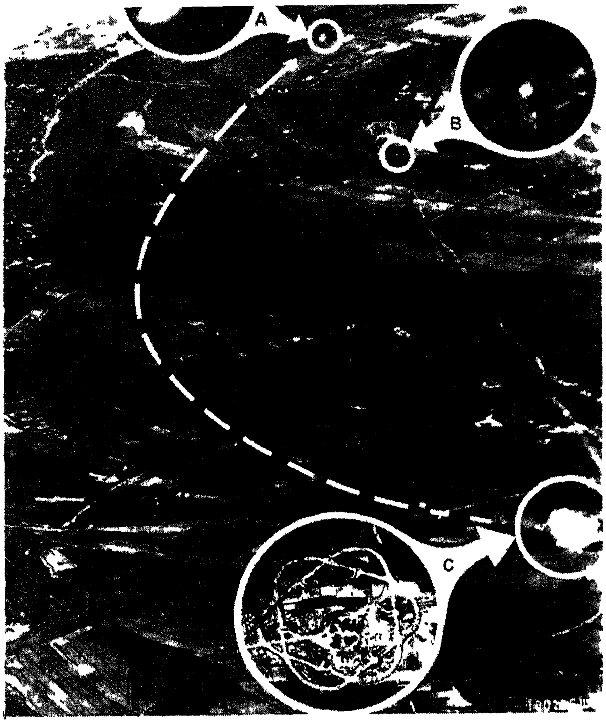
AERIAL. *See* ANTENNA

AERIAL SURVEY, photographing of territory by aircraft for mapping or military intelligence Experience gained during World War I showed that aerial surveying possesses valuable scientific and commercial applications Almost all of continental United States has since been surveyed by the U S Department of Agriculture in a program for determining the regions best suited to certain crops Aerial surveying, usually much cheaper and quicker than the customary land-surveying methods, is also much more detailed and complies with the accepted standards of mapping accuracy. *See* SURVEYING

The continuing development of cameras and of new, more efficient photographic film has made aerial photography a most important factor in modern warfare Pictures taken from miles above the earth are almost incredible in detail Color photographs (*see* PHOTOGRAPHY *Color Photography*) and photographs taken with haze-penetrating infrared film are valuable in the exposure of camouflage (q v) Photographs at night are taken on supersensitive film in moonlight or with the aid of searchlights or magnesium flash bombs

Aerial surveys are commonly made with the camera center vertical Frequency of exposure is timed to provide at least 50 percent of picture overlay in the direction of the flight. If a single flight line does not give sufficient breadth of coverage, additional parallel lines are flown with a side overlap of 30 percent or more The photographs are then mounted to form a mosaic and yield a maplike picture Two aerial pictures of the same terrain can be viewed stereoscopically, the resultant three-dimensional image is called a stereogram This is literally a scale model of the terrain on which the viewer can measure the horizontal distance and elevational difference between any two points he can see Such surveys assist in the location of petroleum and ore deposits, *see* GEOLOGY.

Aerial surveillance is also of considerable military importance The jet-powered U-2 was an



High-flying U.S. reconnaissance planes provide detailed information on enemy terrain and installations. This photograph shows two surface-to-air missiles fired at a U.S. Air Force reconnaissance jet, near Hanoi, North Vietnam. Inset A shows one of the missiles in normal flight (the white dotted line represents flight path). Inset B shows the exhaust of one missile seconds before it exploded. Inset C is a blown-up photograph of the site that launched the missiles.

espionage plane designed by the U.S. in the 1950's to fly at altitudes above 60,000 ft. The wing design of the U-2 permitted long-distance gliding without engine power to reduce the likelihood of detection from the ground. More recently, aerial surveillance has largely been taken over by artificial earth satellites and both the U.S. and the Soviet Union orbit satellites equipped with infrared sensors and high-resolution cameras that can reveal objects 30 ft. in size from altitudes of 500 mi. *See* Satellite, Artificial.

The U.S. initiated in 1966 a system of Earth Resources Observation Satellites (EROS) for topographic mapping of the surface of the earth, and for surveying potential mineral and water resources. *See also* Geophysics; Map. L.A.B.

AERO-. For terms not found under this prefix, see Air-.

AERODYNAMICS, branch of fluid mechanics (q.v.) that deals with the motion of air and other gaseous fluids, and with the forces acting on bodies in motion relative to such fluids. The motion of an airplane through the air, the wind forces exerted on a structure, and the operation of a windmill are all examples of aerodynamic action; *see* Airplane; Windmill; Wind Tunnel.

One of the fundamental laws governing the motion of fluids is Bernoulli's principle (q.v.), which relates an increase in flow velocity to a decrease in pressure and vice versa. Bernoulli's principle is used in aerodynamics to explain the lift of an airplane's wing in flight. A wing is so designed that air flows more rapidly over its upper surface than its lower one, leading to a decrease in pressure on the top surface as compared to the bottom. The resulting pressure difference provides the lift that sustains the aircraft in flight; *see* Flight, Theory of. The velocity of a wind that strikes the bluff surface of a building is close to zero near its wall. According to Bernoulli's principle, this would lead to a rise in pressure relative to the pressure away from the building, resulting in wind forces which the structures must be designed to withstand.

Another important aspect of aerodynamics is the drag or resistance acting on solid bodies moving through air. The drag forces exerted by the air flowing over the airplane, for example, must be overcome by the thrust force developed by either the jet engine or the propellers. These drag forces can be significantly reduced by streamlining the body. For bodies that are not fully streamlined, the drag force increases approximately with the square of the speed as they move rapidly through the air. The power required, for example, to drive an automobile steadily at medium or high speeds is primarily absorbed in overcoming air resistance. Thus the power required to drive a car at 70 m.p.h. is almost twice as much as that required at 50 m.p.h.

See also Jet Propulsion; Propeller; Supersonics.

F.La.

AEROEMBOLISM. *See* Bends.

AEROLOGY. *See* Meteorology.

AERONAUTICS, general term covering all phases of the science and art of operation of aircraft. *See* Airplane; Airship; Aviation; Helicopter; Supersonics; *see also* Federal Aviation Administration. Compare Astronautics.

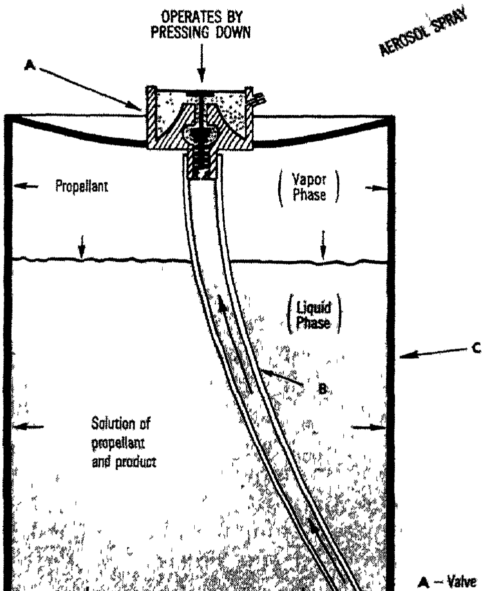
AERONOMY. *See* Meteorology.

AEROPE. *See* Atreus; Thyestes.

AEROSOL, suspension in air of microscopic liquid or solid particles, such as smoke, smog, or insecticide (qq.v.), that tend to remain dispersed rather than to settle. Fog (q.v.) is the commonest example of this phenomenon. Aerosol insect bombs, because of this principle, are effective in killing flying insects, particularly in enclosed or sheltered places. The bomb contains an oil solution of insecticides and a liquid that vaporizes at room temperature. When a valve in the bomb is opened, the vapor sprays from a nozzle and propels the insecticide into the air, thus dispersing the oil droplets. *See* Colloidal Dispersion.

Other commercial aerosols, similarly operated with push-button valves, are used to disperse hair sprays, deodorants, medicinal substances, and many other materials One type can dispense dry powder

The propellants used for 90 percent of the nonfood sprays, fluorocarbon 11 ($CFCl_3$) and fluorocarbon 12 (CCF_2Cl_2), are exceptionally inert and nontoxic compounds of carbon, fluorine, and chlorine In 1974 it was discovered that each year 800,000 tons of these fluorocarbons, half of them discharged in aerosol sprays, were floating unchanged up to the stratosphere There, intense sunlight could break off the chlorine atoms, each of which in turn could break up thousands of ozone molecules (O_3) in the stratospheric ozone layer *See* ATMOSPHERE Since this thin layer of ozone absorbs the excessive ultraviolet rays that would otherwise damage many forms of life on earth, several scientific studies were begun in 1975 to determine whether the ozone layer was self-repairing or whether it was being depleted permanently Conclusive analysis was expected to take several years In the meantime, other propellants were beginning to replace fluorocarbons in aerosol spray containers



In this cross section of a typical aerosol container, designed for spraying an area or for surface coating, gas under pressure is used to spray atomized liquid

E I du Pont de Nemours & Company

AEROSPACE MEDICINE, branch of medicine concerned with the physiological and psychological stresses upon the human body in flight through the atmosphere (q v) or in the space environment The term embraces the fields of aviation medicine and space medicine (qq v)

Aerospace medicine was recognized by the American Medical Association as a subspecialty in preventive medicine in 1953 Aerospace medical specialists, along with members of allied specialties in the biological and physical sciences, form part of the interdisciplinary team that also includes engineers who carry out research and development programs to advance aerospace technology

History. Aerospace medicine is rooted in the early 18th-century physiological studies of balloonists and mountain climbers Particularly significant were the contributions of John Jeffries (1744–1819), an American physician living in England, who in 1784 made the first scientific study of the upper-air composition from a balloon The principles and practice of aerospace medicine in all major nations have kept pace with the rapid advances in aircraft and rocket technology during the 20th century In the United States, for example, physical and psychological standards for aviators were established by the Surgeon General of the Army shortly before World War I Following the war, the School of Aviation Medicine was established at Randolph Air Force Base, Texas The first Department of Space Medicine was set up there in February, 1949, under the direction of Dr Hubertus Strughold (1898–   ), pioneer in German aviation medicine In 1959 the school was moved to new and expanded facilities at nearby Brooks Air Force Base, Texas, and renamed the School of Aerospace Medicine As early as 1926, civil aviation medicine had gone forward with the establishment of a medicine section in the Bureau of Air Commerce within the U S Department of Commerce Other important military research and training institutions include the U S. Naval School of Aviation Medicine at Pensacola, Fla , organized in 1939, the Aviation Medical Acceleration Laboratory at Johnsville, Pa., and the Naval Aircrew Equipment Laboratory at Philadelphia, Pa

Experimental military aircraft in the post-World War II period, namely the X-12 and the X-15, had brought man to the limits of the earth atmosphere, providing additional valuable information about both the environment and about human physiological reactions to high-speed, high-altitude travel In addition, aerospace medicine profited from biological experiments in the upper atmosphere. These were carried out on a limited basis in the post-World War II period by military and university scientists, using captured German V-2 rockets at Holloman Air Force Base, New Mexico Manned and unmanned balloon flights to study the effects of altitude were other forerunners of actual space flight

Space Research. The U S. National Aeronautics and Space Administration (q.v), or NASA, is responsible for nonmilitary manned and unmanned space exploration for scientific, including medical, purposes The agency works closely with the scientific community and with the Department of Defense in carrying out all phases of aerospace medical research and applied space medicine Limited NASA-conducted research in the biological sciences is centered at Ames Research Center, California, and Langley Research Center, Virginia, whereas applied aerospace medicine research and medical operations for manned space flight are centered at the Lyndon B Johnson Space Center, Houston, Texas For the most part, NASA contracts with universities and industry for its research and development in aerospace medicine, biology, and life-support research and technology. In the late 1960's and early 1970's, NASA concentrated largely upon its aeronautics research and development efforts Related civilian and military projects helped advance clinical, environmental, and preventive aerospace medicine. Advanced research involved (1) traditional stress problems; (2) biological effects of time lag in high-speed, global transport; (3) physical effects of supersonic aircraft upon the earth environment and ground population, and (4) the endemic communicable-disease problems facing the global traveler..*See* ASTRONAUTICS; SPACE BIOLOGY M M.L.

AESCHINES (389–314 B C), ancient Greek orator, born in Athens Aeschines became one of the leading men of the Athenian state through his eloquence and his legal knowledge. As a member of an embassy to Philip II (q v.), King of Macedonia, in 347 B C., he decided that Athenian resistance to the Macedonians would be futile, and so became the leader of the peace party at Athens in opposition to the orator Demosthenes (q v.), the spokesman for those who believed that Philip should be resisted at any cost Aeschines' hatred of his rival, however, led to his downfall In 337 B C he prosecuted the Athenian orator Ctesiphon (fl 4th cent B.C) when the latter proposed that a golden crown be awarded to Demosthenes; the charge was actually an attack upon the whole foreign policy of Demosthenes The trial took place in 330 B C Aeschines lost the case and was fined heavily, whereupon he went into exile and, according to tradition, opened a school of oratory at Rhodes His posthumous fame as an orator may be attributed to his three extant speeches *Against Timarchus, On the Embassy,* and *Against Ctesiphon*

AESCHYLUS (525–456 B C), Greek dramatist, the earliest of the great tragic poets of Athens and hence called the "Father of Greek Tragedy", born in Eleusis, near Athens Aeschylus fought successfully against the Persians at Marathon in 490 B C, at Salamis in 480, and possibly also at Plataea in the following year He made at least two trips to Sicily, possibly three During his final visit he died at Gela, where a monument was later erected to his memory

The Plays. Aeschylus is said to have written about ninety plays. His tragedies, first performed about 500 B C, were presented as trilogies, or groups of three, usually bound together by a common theme, and each trilogy was followed by a satyr drama (low comedy involving a mythological hero, with a chorus of satyrs) The titles of seventy-nine of his plays are known, but only seven have survived The earliest is *The Suppliants,* a drama with little action but many choral songs of great beauty, it is believed to be the first play of a trilogy about the fifty daughters of Danaus, which included the plays entitled *The Egyptians* and *The Danaïds. The Persians,* presented in 472, is a historical tragedy about the Battle of Salamis, the scene being laid in Persia at the court of the mother of King Xerxes I (q v.) No relationship between this drama and any of the other titles known is apparent.

The Seven Against Thebes, produced in 467, is based on a Theban legend, the conflict between the two sons of Oedipus, Eteocles and Polyneices for the throne of Thebes (*see* SEVEN AGAINST THEBES). It is generally believed to be the third play of a trilogy, of which the first two plays were entitled *Laius* and *Oedipus. Prometheus Bound,* a work of uncertain date, portrays the punishment of the defiant Prometheus by Zeus It is probably the first play of a Promethean trilogy, the others being the plays entitled *Prometheus Unbound* and *Prometheus the Fire-Bringer.*

The remaining three plays, *Agamemnon, The Libation Bearers,* and *The Eumenides,* produced in 458, form the trilogy known as the *Oresteia,* or story of Orestes In *Agamemnon,* one of the greatest works of dramatic literature, King Agamemnon returns home from Troy and is treacherously murdered by his faithless wife Clytemnestra In the second play, Orestes, the son of Agamemnon, returns to Argos and avenges the murder of his father by slaying his mother and her paramour Aegisthus This act of matricide is punished by the avenging goddesses, the Erinyes In *The Eumenides,* Orestes is pursued by the Erinyes until he is cleansed of his blood guilt and set free by the ancient court of the Areopagus, through the intercession of Athena, goddess of wisdom

Importance. Aeschylus is generally considered the originator of Greek tragedy By introducing a second actor into the play, he created dramatic dialogue, he also made many alterations in the form and staging of the drama The characteristics of his works are simplicity, picturesqueness, and grandeur He had a deep and abiding interest in religion, and the *Oresteia,* probably his most mature work, provides an insight into his concepts of justice and mercy, and his belief in a divine will, with the aid of which man can achieve wisdom through suffering

See also separate articles on the various Greek legendary figures mentioned G E D

AESCULAPIAN SNAKE, common name for a harmless snake, *Elaphe aesculapii,* common in many parts of Europe It is a smooth, glossy, slender snake, uniformly brownish in color, with a streak of darker color behind the eyes The genus *Elaphe* includes several other European snakes, including the leopard snake, and several American snakes, including the corn snake, chicken snake, fox snake, and pilot blacksnake (q v)

Aesculapian snakes, symbols of the god of medicine Aesculapius (q v), were kept in the combination hospital-temples erected by the ancient Greeks and Romans in honor of the god As a result, the snake is abundant not only in its normal range, southern Europe, but also in numerous restricted localities in Germany and Austria where specimens that escaped from the temples established by Roman colonists survived and propagated the species

AESCULAPIUS, in Greek mythology, the god of medicine He was a son of the god Apollo (q v) and Coronis, a beautiful maiden of Thessaly. Angry because Coronis was unfaithful to him, Apollo killed her and took his infant son to the centaur Chiron to be raised (*see* CENTAURS) Aesculapius learned all that Chiron knew about the art of healing and soon became a great physician Because he committed the unpardonable sin of raising a man from the dead, the god Zeus (q v) killed him with a thunderbolt For hundreds of years after his death the sick resorted to the many temples built in his honor. There they offered sacrifices and prayed to Aesculapius, the god, they believed, would then come to them in dreams and prescribe cures for their illnesses

A Roman statue of Aesculapius, the Greek god of medicine, often represented with a staff and serpent

AESOP (about 620–560 B C), ancient Greek writer of fables who is supposed to have been a freed slave from Phrygia His name became attached to the beast fables, long transmitted through oral tradition The beast fables are part of the common culture of the Indo-European peoples and constitute perhaps the most widely read collection of fables in world literature (*see* FABLE) Many of Aesop's fables were rewritten in verse by the Greek poet Babrius, probably in the 1st or 2nd century A D, and in Latin verse by the Roman poet Phaedrus in the 1st century A D The collection which now bears Aesop's name consists for the most part of prose paraphrases of the fables of Babrius.

AESTHETICS, *or* ESTHETICS, branch of philosophy concerned with the essence and perception of beauty and ugliness, and whether such qualities are objectively present in the things they appear to qualify, or whether they exist only in the mind of the individual, hence, whether objects are perceived by a particular mode, the aesthetic mode, or whether instead the objects have, in themselves, special qualities—aesthetic qualities

Criticism and the psychology of art, although independent disciplines, are related to aesthetics The psychology of art deals with such elements of the arts as human responses to color, sound, line, form, and words, and with the emotional factors which condition such responses

Criticism confines itself to particular works of art, analyzing their structure, meaning, and problems, comparing them with other works, and evaluating them

The term "aesthetics" was introduced in 1753 by the German philosopher Alexander Gottlieb Baumgarten, but the study of the nature of beauty had been pursued for centuries

The Classical Period. The first aesthetic theory of any scope is that of the Greek philosopher Plato, who believed that reality consists of archetypes, or forms, beyond human sensation, which are the models for all things that exist in human experience The objects of such experience are examples, or imitations, of those forms The philosopher tries to reason from the object he experiences to the reality it imitates, the artist copies the experienced object, or uses it as a model for his work Thus, the artist's work is an imitation of an imitation it is two removes from what is believed to be reality

Plato's thinking had a marked ascetic strain In his *Republic* Plato went so far as to banish some types of artists from his ideal society because he thought their work encouraged immorality or portrayed base characters, and that certain musical compositions caused languidness or incited men to immoderate actions

The Greek philosopher Aristotle also spoke of art as imitation, but not in the Platonic sense One could imitate "things as they ought to be", he wrote, and "art partly completes what nature cannot bring to a finish". The artist separates the form from the matter of some object of experience, such as the human body or a tree, and imposes that form on another matter, such as canvas or marble. Thus imitation is not just copying an original model, nor is it devising a symbol for the original; rather, it is a particular representation of an aspect of things, and each work is an imitation of the universal whole

Aesthetics was as inseparable from morality and politics for Aristotle as for Plato The former wrote about music in his *Politics,* maintaining that art affected human character, and hence the social order Because Aristotle held that happiness was the aim of life, the major function of art was to provide human satisfaction. In the *Poetics,* his great work on the principles of drama, Aristotle argued that tragedy so stimulated the emotions of pity and fear, which he held to be morbid and unhealthful, that by the end of the play the spectator was purged of them This catharsis made the audience psychologically healthier, and thus more capable of happiness Neoclassical drama has been greatly influenced by Aristotle's *Poetics* The works of the French dramatists Jean Baptiste Racine, Pierre Corneille, and Molière, in particular, advocate its doctrine of the three unities time, place, and action This concept dominated literary theories up to the 19th century

The philosopher Plotinus, born in Egypt and trained in philosophy at Alexandria, although a Neoplatonist, gave far more importance to art than did Plato In his view art reveals the form of an object more clearly than ordinary experience does, and raises the soul to contemplation of the universal According to Plotinus, the highest moments of life are mystical, which is to say that the soul is united, in the world of forms, with the divine, which Plotinus spoke of as "the One" Aesthetic experience comes closest to mystical experience, for one loses himself while contemplating the aesthetic object

The Modern Period. Art in the Middle Ages was chiefly an expression of religion, with an aesthetic principle based largely upon Neoplatonism During the Renaissance (q v), art became more secular, and its aesthetics were classical rather than religious The great impetus to aesthetic thought in the modern world occurred in Germany during the 18th century. The German critic Gotthold Ephraim Lessing, in his *Laokoon* (1766), argued that art is self-limiting, and reaches its apogee only when these limitations are recognized The German critic and classical archeologist Johann Joachim Winckelmann maintained that, in accordance with the ancient Greeks, the best art was impersonal, expressing ideal proportion and balance rather than its creator's individuality Johann Gottlieb Fichte, a philosopher and metaphysician, considered beauty a moral virtue. The artist creates a world of his own in which beauty, as much as truth, is an end, foreshadowing that absolute freedom which is the goal of the human will. For Fichte, art is individual, not social, but it fulfills a great human purpose.

The German philosopher, Immanuel Kant was concerned with judgments of taste Objects are judged beautiful, he proposed, when they satisfy a disinterested desire· one that does not involve our personal interests or needs It follows from this that beautiful objects have no specific purpose, and that judgments of beauty are not expressions of mere personal preference, but are universal instead, and that although we cannot be certain that others will be satisfied by objects we judge to be beautiful, we can at least say that they ought to be satisfied. The basis for one's response to beauty exists in the structure of one's mind.

Art should give the same disinterested satisfaction as natural beauty. Paradoxically, art can accomplish one thing nature cannot. It can offer ugliness and beauty in one and the same object. A fine painting of an ugly face is nonetheless beautiful.

According to the philosophy of the German Georg Wilhelm Friedrich Hegel, art, religion, and philosophy are the bases of the highest spiritual development. Beauty in nature is everything that the human spirit finds pleasing and congenial to the exercise of spiritual and intellectual freedom. Certain things in nature can be made more congenial and pleasing, and it is these natural objects which are reorganized by art to satisfy aesthetic demands.

The German philosopher Arthur Schopenhauer believed that the forms of the universe, like the eternal Platonic forms, exist beyond the world of experience, and aesthetic satisfaction is achieved by contemplation of them for their own sakes, as a means of escaping the painful world of daily experience.

Fichte, Kant, and Hegel are in a direct line of development. Schopenhauer attacked Hegel but was influenced by Kant's view of disinterested contemplation. The German philosopher and poet Friedrich Wilhelm Nietzsche followed Schopenhauer at first, then disagreed with him. Nietzsche concurred that life was tragic, but thought that this should not preclude man's acceptance of the tragic with joyous affirmation, the full realization of which is art. Art confronts the terrors of the universe, and is therefore only for the strong. Art can transform any experience into beauty, and by so doing transforms its horrors in such a way that man can contemplate them with enjoyment.

Although much of modern aesthetics is rooted in German thought, German thinking was subject to other Western influences. Lessing, a founder of German Romanticism (q.v.), was affected by the aesthetic writings of the British statesman Edmund Burke.

Major controversies over the nature and use of art have usually resulted from the practices and pronouncements of artists, not from the speculations of philosophers. The French painter Gustave Courbet urged that artists paint objects in their own milieu realistically. The impressionists argued that when artists depict what they really see, rather than what they think they should see, they paint surfaces of many colors and of wavering forms, because light erodes form and alters it as the sun moves and shadows change. Thus, academic paintings could be denounced as portrayals of what artists had been taught to look for rather than of what they actually saw.

During the last quarter of the 19th century a group of French artists, including André Derain, Paul Cézanne, Paul Gauguin, and Henri Matisse, revolted against impressionism (q.v.). They were concerned with symbolizing picture structure, volume, and the artist's own psyche. A corresponding symbolism appears in the writing of the French poet Charles Baudelaire and an entire generation of French poets.

Expressionism (q.v.), in contrast to impressionism, subordinates the representation of objects to the expression of emotion. The term "expressionism" was first used in 1911 in Munich as the designation of a German school of art. It was used also to designate a literary movement which originated in the theater with the plays of the Swedish playwright August Strindberg and the German playwright Frank Wedekind.

One of the artists' most persistent credos is "art for art's sake", a phrase used by the French philosopher Victor Cousin in 1818. This doctrine was espoused in 19th-century Great Britain by the British critic Walter Horatio Pater and the expatriate American painter James Abbott McNeill Whistler. The British critic Matthew Arnold felt that art must criticize life.

Eighteenth-century aesthetics was dominated by the concept of art as imitation, thereafter, it was based increasingly on art as expression, wherein the artist does not state his meanings, as the scientist does, but expresses himself in the work of art.

The Contemporary Period. Four philosophers of the late-19th and early-20th centuries have been the chief influences on present-day aesthetics. The French philosopher Henri Bergson defined science as the use of intelligence to create a system of symbols that supposedly describes reality but actually falsifies it. Art, however, is based on intuition, which is a direct apprehension of reality unmediated by thought. Thus art cuts through conventional symbols and beliefs about man, life, and society, and confronts one with reality itself.

The Italian philosopher Benedetto Croce also exalts intuition, but considers it to be the immediate awareness of an object which, somehow, gives it form It is the apprehension of things before one reflects about them Works of art are the expression, in material form, of such intuitions, but beauty and ugliness are qualities not of the works of art but of the spirit expressed intuitively in such works

The American philosopher and poet George Santayana argued that when one takes pleasure in a thing he may regard the pleasure as a quality of the thing itself, rather than as a subjective response to it Just as one may characterize some human act as good in itself, instead of calling it good merely because one approves it, so one may say that some object is beautiful, not merely that one's aesthetic delight in its color and form leads one to call it beautiful

John Dewey, the American educator and philosopher, viewed human experience as disconnected, fragmentary, full of beginnings without conclusions, or as experiences deliberately manipulated as means to ends Those exceptional experiences which flow from their beginnings to consummations are aesthetic Aesthetic experience is enjoyment for its own sake, is complete and self-contained, and is terminal, not merely instrúmental to other purposes

Two powerful movements, Marxism in the fields of economics and politics and Freudianism in psychology, have had important consequences for contemporary aesthetics. Marxism treats art as an expression of the underlying economic relations in society Marxist proponents maintain that art is great only when it is "progressive", that is, when it supports the cause of the society under which it is created

The Austrian neurologist and originator of psychoanalysis, Sigmund Freud, believed the value of art to lie in its therapeutic use: it is by this means that the artist or the reader can reveal his hidden conflicts and discharge his tensions Fantasies and daydreams, as they enter into art, are thus transformed from an escape from life into ways of meeting it In the surrealist movement in painting and poetry, the unconscious is used as a source of material. *See* SURREALISM. The stream-of-consciousness (q.v.) technique of fiction, notably in the writings of the Irish writer James Joyce, derived not only from Freud's work but partly from *The Principles of Psychology* (1890) by the American psychologist and philosopher William James and partly from the novel *Les Lauriers Sont Coupés* (1887; Eng trans , *We'll to the Woods No More,* 1957) by the French writer Édouard Dujardin (1861–1949).

More recently the form of existentialism (q.v.) advocated by the French philosopher, novelist, and dramatist Jean-Paul Sartre has stated that art is an expression of the freedom of man to choose, and as such demonstrates his responsibility for his choices Despair, as reflected in art, is not an end, but a beginning, because it eradicates the guilts and excuses from which men ordinarily suffer, thus opening the way for genuine freedom

Academic controversies of the 20th century have revolved about meaning in art The British critic and semanticist Ivor Armstrong Richards, believes that art is a language He asserts that there are two types of language the symbolic, which conveys ideas and information, and the emotive, which expresses, evokes, and excites feelings and attitudes Art is emotive language, giving order and coherence to experience and attitudes, but containing no symbolic meaning.

Richards' work is important also for its use of psychological techniques in studying aesthetic reactions. His book, *Practical Criticism* (1929), describes experiments which revealed that even highly educated people were conditioned by their education, by handed-down opinion, and by other social and circumstantial factors in their aesthetic responses Other writers have commented on the conditioning effects of tradition, fashion, and other social pressures, using as illustrations the shifts of tastes in certain periods during which William Shakespeare was viewed as barbarous and Gothic art as vulgar

Growing interest in aesthetics is revealed by the establishment of three periodicals devoted to the subject. The *Journal of Aesthetics and Art Criticism* was founded in the United States in 1941, the *Revue .d'Esthétique* was founded in France in 1948, and *The British Journal of Aesthetics,* founded in 1960.

Articles on those persons whose life dates are not provided may be found under individual headings. A C D. & R R

AESTIVATION. *See* HIBERNATION

AETA, Negrito people, found in the Philippine Islands; *see* PYGMIES; RACES OF MANKIND. *Racial Classification Negroid Race.*

AETNA. *See* ETNA.

AETOLIA, district of ancient Greece on the N coast of the Gulf of Corinth. In Greek mythology, Meleager, son of the king of Calydon, slew the Calydonian boar in Aetolia The people of Aetolia began to figure prominently in recorded history about the time of the death of the Macedonian ruler Alexander III (q v.), known as the Great, in 323 B.C. The Aetolian League, similar to the Achaean League (q.v.), was formed toward the close of the 4th century B C and waged war against the Achaean League, Macedonia, and eventually even against Rome, its former ally The Romans defeated the Aetolian League in 189 B C and put an end to its political influence. Aetolia forms part of the present-day Greek department (or nome) of Aetolia and Acarnania

AFARS AND ISSAS, FRENCH TERRITORY OF THE, former name of DJIBOUTI, a republic of N E Africa Known as French Somaliland until 1967, it is bounded on the E by the Strait of Bab el Mandeb (the entrance to the Red Sea) and the Gulf of Aden, on the S.E by the Somali Republic, and on the S and W. by Ethiopia Djibouti is the capital, largest city (pop 1976 est 120,000), and principal port Area about 8500 sq mi , pop. (1976 est) 226,000, including more than 42,000 Afars and 58,000 Issas The Afars are a branch of the Danakil peoples of Ethiopia, and the Issas are closely related to the people of the Somali Republic The overall population density is about 27 per sq.mi. (1976 est.)

The country, consisting principally of arid plains, is largely devoid of water except in the S border region Inland Djibouti is broken by a series of closed saltwater basins and mountain ranges N. of the Gulf of Tadjoura rising to heights of 5000 to 6000 ft Djibouti has a mean temperature of 85° F., but during the hot season (May to October) temperatures reach 107° F Annual rainfall varies from about 5 in. on the coast to 20 in in the mountainous areas Agriculture is limited by the lack of water Vegetables and dates are the main crops The most important agricultural occupation is the raising of livestock, mainly goats

The main industries are ship repair, construction, salt extraction, and food processing An important economic activity is the transportation of goods to and from Ethiopia via the Djibouti-Addis Ababa Railroad, a 60-mi section of the only railroad connecting central Ethiopia with the seacoast Djibouti serves as a base for air transport between Europe, East Africa, the Arabian Peninsula, and India. It was made a free port of call in 1949

Legislative power in Djibouti is vested in a 40-member Chamber of Deputies The republic's chief executive is a president, chosen by the chamber A cabinet, headed by a premier, is the principal administrative body The country belongs to the United Nations, the Organization of African Unity, and the Arab League

France secured an initial foothold in the region in 1856 Treaties negotiated with Somali rulers between 1883 and 1887 extended French possessions to cover the entire Gulf of Tadjoura region In 1888 an agreement with Great Britain defined the southern boundary of the French protectorate Its northern boundary was subsequently fixed by agreements with Italy. The protectorate became an Overseas Territory of France in 1946 In 1958 the population voted to maintain the status of an Overseas Territory Following agitation by Somali nationalists, a referendum on March 19, 1967, reaffirmed the desire of the population to remain within the French Community Independence movements continued, however, and the strategically located country became independent as Djibouti on June 27, 1977 Hassan Gouled Aptidon (1916–) was chosen as the republic's first president

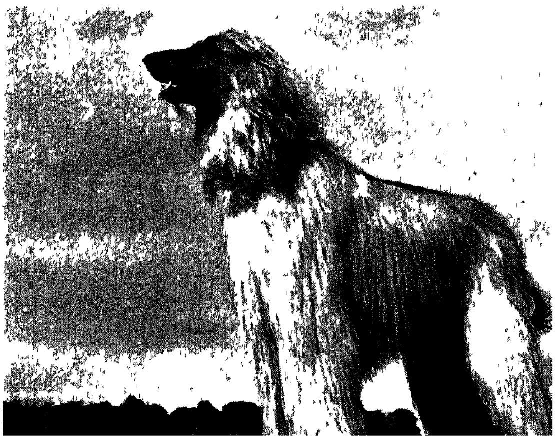
AFFENPINSCHER (Ger., "monkey terrier"), small sturdy dog of the toy breed classification The fur may be black, red, or gray in color, and the coat is short and wiry except in the chest area and on the face where it becomes shaggy The dog's facial features mirror its namesake, the monkey, with pointed ears, bushy eyebrows, and a prominent chin tuft and mustache. The affenpinscher stands approximately 10 in. high at the shoulder and usually averages 7 to 8 lb in weight. It serves as a friendly pet

AFFIDAVIT, in law, voluntary written statement sworn before an officer qualified to administer an oath Both the person making the affidavit, that is, swearing to the truth of the facts contained in the document, and the witnessing officer, as a judge, a commissioner of deeds, or a notary public, are usually required to sign the document. Affidavits are frequently used in preliminary legal proceedings, for example, in filing, or starting, a law suit. Persons who swear falsely in an affidavit may incur severe legal punishment. *See* DEPOSITION.

AFFONSO THE GREAT. *See* ALBUQUERQUE, AFFONSO DE.

AFGHAN HOUND, breed of sporting dog that has long been found in the hill country of northern Afghanistan. Evidence exists that the

Afghan hound Marion Florsheim



breed was known in Egypt as far back as 4000 and 3000 B.C. Soldiers returning home after World War I introduced the breed into England, and it was brought to the United States about 1931 The Afghan hound weighs about 60 lb and stands about 27 in high It has a narrow head, like that of the greyhound, a long neck, straight, strong forelegs, and thick, silky hair A hunter, the Afghan hound trails its game by sight The dog is especially valuable in hilly country because of its ability to turn easily and execute powerful leaps

AFGHANISTAN (Persian *Afghánistán*), constitutional monarchy of central Asia until July, 1973, when it was declared a republic in a coup d'etat Afghanistan is bounded on the N by the Turkmen, Uzbek, and Tadzhik republics of the U S S R; on the N E by China, Jammu and Kashmir, and Pakistan, on the S E and S by Pakistan; and on the W by Iran The country extends from about lat 29°25′ N. to lat. 38°35′ N and long. 60°50′ E to long. 75° E, it is roughly elliptical in shape and has a maximum length, from N E to S W, of about 900 mi and a width of about 450 mi The area of the country is about 250,000 sq mi, approximately the size of Texas, with which it also compares in geographic latitude

THE LAND

Afghanistan is a predominantly mountainous country, about three fourths of its surface consists of uplands The main lowlands are a series of river valleys in the N and various desert regions to the S and S W The principal mountain system of the country is the Hindu Kush (q v), which, with its various offshoots, extends for about 600 mi from the Pamirs (q v.), a range in the N E, to the borders of Iran in the W The average altitude of the Hindu Kush is more than 14,000 ft, some peaks are nearly 25,000 ft. The highest summit of the range is Tirich Mir (25,230 ft), across the Pakistani border. Natural passes penetrate the mountains of Afghanistan at various points, facilitating travel within the nation as well as communication with neighboring countries In the Hindu Kush the only pass lower than 10,000 ft is the Shibar (9800 ft), which connects the Kabul region with the N part of the country. Probably the best known of the mountain passes is the historic Khyber Pass (q v.) on the N E border, which traverses the Sulaiman Range and affords relatively easy access to the Peshawar Province of Pakistan.

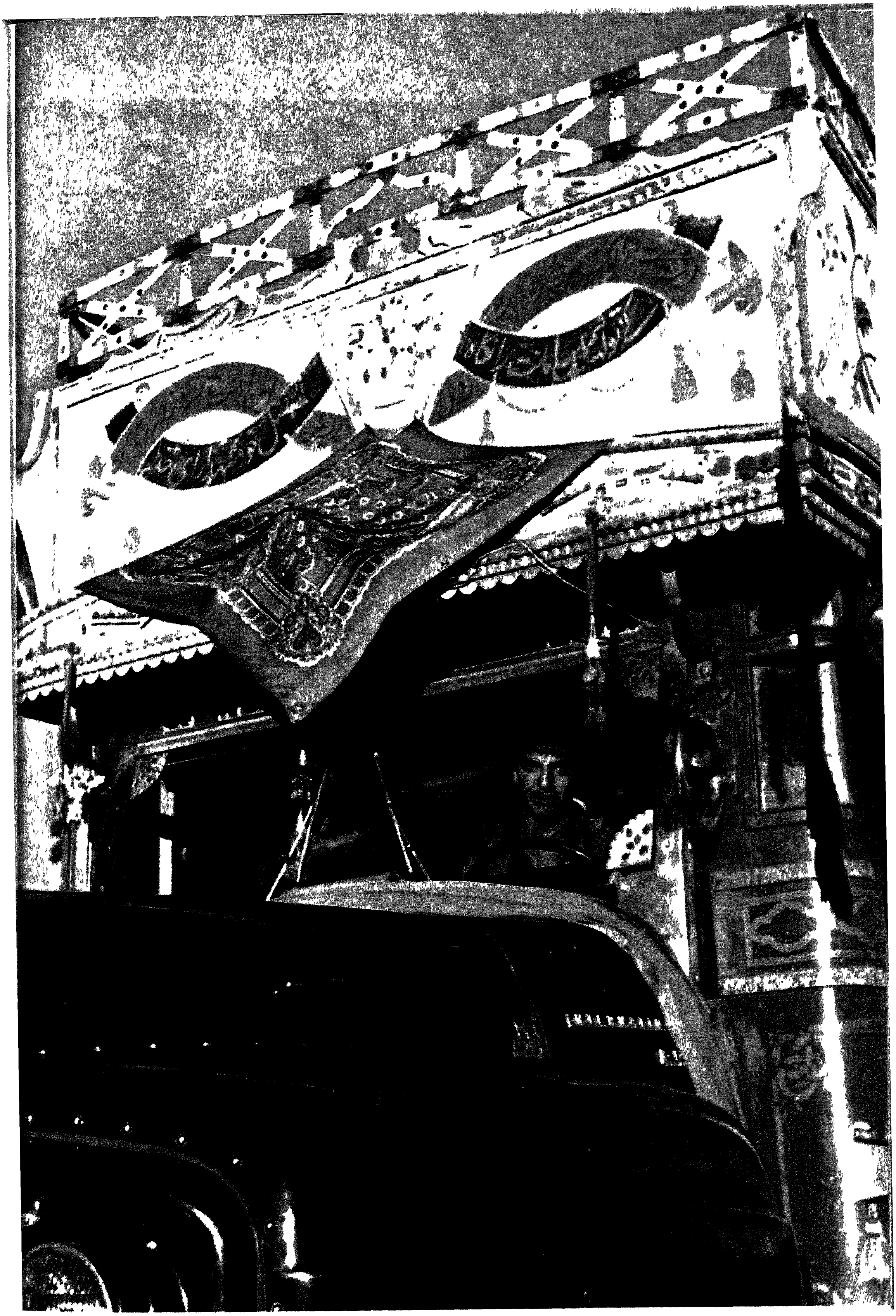
The chief rivers of Afghanistan are the Amu-Dar'ya known in ancient times as the Oxus, on the border of the U.S.S.R; the Kabul, which flows into the Indus R; the Helmand, the longest river in the country, in the S, and the Hari Rud (qq v), in the W All of these rivers except the Kabul empty into lakes or swamps

Climate. Climatic conditions in Afghanistan exhibit great daily and seasonal variations, largely because of the extremes in altitude that characterize the country During the day variations in temperature may range from freezing conditions at dawn to almost 100° F at noon Summer temperatures as high as 120° F have been recorded in the N valleys. Midwinter temperatures as low as 15° F. are common at the 6500-ft level in the Hindu Kush Kabul (6000 ft) has cold winters and pleasant summers Jalalabad (1800 ft) is subtropical, and the climate of Kandahar (3500 ft) is mild Afghanistan is a relatively dry country, the annual rainfall averaging about 12 in Most of the rainfall occurs between October and April Sandstorms occur frequently in the deserts and arid plains

Natural Resources. Despite the arid climate and mountainous terrain, the natural resources of Afghanistan are mainly agricultural A variety of mineral deposits exists, but transportation difficulties and lack of native technical skills and equipment have hindered full exploitation of such resources. In Mazar-i-Sharif utilization of natural gas in the province of Shibarghan is being exploited

Plants and Animals. The plant life of Afghanistan resembles that of Tibet and the Himalayan region in general, as well as that of the Near Eastern plains and deserts. Forests of cedar, pine, and other conifers are found at elevations between 6000 and 12,000 ft As the result of overcutting, forests now occupy only about 2 percent of the land area At lower altitudes are found such shrubs and trees as hazel, pistachio, ash, juniper, and tragacanth. Below the 3000-ft. level vegetation, consisting largely of herbs and some shrubs, is quite sparse Many varieties of wild flowers bloom in the spring, both in the mountains and on the grassy steppes Forest products include resin, asafetida, and piñon (pine nuts), as well as timber and firewood Among the various fruit trees are the apricot, peach, pear, apple, almond, and walnut Date palms flourish in the extreme S, and pomegranates and citrus fruits grow in the vicinity of Kandahar and Jalalabad Grapes and melons of excellent quality and unusual variety are common.

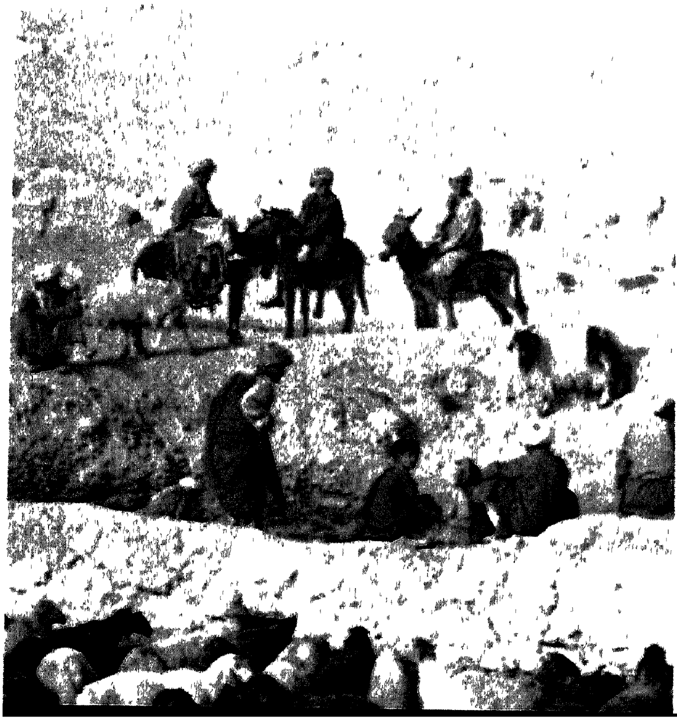
Indian, European, and Near Eastern fauna inhabit Afghanistan The dromedary and the Bactrian camel abound. Indigenous wild animals include mountain sheep, bears, ibex, gazelles, wolves, jackals, wildcats, hedgehogs, and foxes. The principal domesticated animals are sheep,

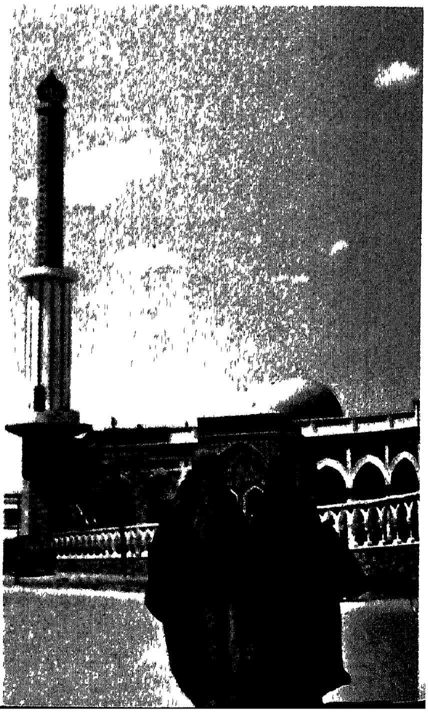


Afghanistan. Plate 1. *Traditional artwork enhances 20th-century machinery as strikingly shown in this bus used for long-distance travel. Such elaborately decorated buses are frequently seen in the Afghan countryside*

Afghanistan. Plate 2. *From top left, clockwise A young woman, in richly embroidered native dress, assumes a classic pose Father and son riding a donkey illustrate a still common mode of transportation in rural areas Veiled women, now a rare sight in large cities, pass Shair Pour Mosque in the capital, Kabul Shepherds stop to water their flocks, sheep raising is a major industry in Afghanistan*

United Nations





cattle, and goats, others include donkeys, horses, mules, and the Afghan hound (q v.), a breed of hunting dog The Karakul sheep of Afghanistan are famous for their pelts Waterfowl, pheasants, quail, and many varieties of smaller land and shore birds are also found

Soils. Arid climate and mountainous terrain are mainly responsible for the relative lack of soil development The larger tracts of arable land in the fertile valleys are the only well-developed natural resource in Afghanistan Of the over 5,500,000 acres of fertile soil, over 3,000,000 are under cultivation, and approximately 2,000,000 acres are under irrigation.

Waterpower. Large-scale irrigation dams and hydroelectric stations are under construction along the major rivers. The most notable undertaking is the Helmand River Valley Project, designed to provide electric power for industry and irrigation for more than 800,000 acres of land. The Mahipar and Naghlu projects on the Kabul R are intended to more than double the existing 58,000,000 kw of electric power

THE PEOPLE

The population, predominantly rural, may be divided into four main ethnic groups The Pathans, or true Afghans, comprise about 60 percent of the total population, and are divided into two subgroups, the Durani and Ghilzais. The Tajiks, of Iranian stock, make up about 30 percent, and the remainder consists of the Uzbeks (5 percent) and Hazaras (3 percent)

Social mobility has become greater in the past two decades. The power of family patriarchs has been lessened, and women have been largely emancipated.

Population. A 1975 United Nations estimate placed the population at 19,280,000. The overall population density is 77 per sq.mi (1975 U N. est) About 70 percent of the people live and work on farms, and approximately 2,500,000 still lead a nomadic life Only about 10 percent of the population live in towns of 3000 or more inhabitants.

Political Divisions. For administrative purposes, Afghanistan is divided into twenty-eight provinces Badakhshan, Badghis, Baghlan, Balkh, Bamian, Farah, Faryab, Ghazni, Ghor, Helmand, Herat, Jouzjan, Kabul, Kandahar, Kapisa, Kunar, Kunduz, Laghman, Logar, Nangarhar, Nimruz, Parwan, Patya, Samangan, Takhar, Uruzgan, Wardak, and Zabul.

PRINCIPAL CITIES. The capital of Afghanistan is Kabul (pop., 1976 est, 587,600), which, from its E. location, commands vital routes through the mountain passes Other major cities are the trading centers of Kandahar (pop , 1973 est., 140,000) and Herat (pop , 1973 est , 109,000), known for its many ancient mosques, palaces, and other architectural relics.

Religion. Islam is the official religion of the country More than 99 percent of the population are Muslims, mainly of the Sunni sect Most of the remainder, notably the Hazaras, belong to the Shi'ite sect Small colonies of Jews, Hindus, and Parsis are scattered in the towns. Mazar-i-Sharif is the leading place of pilgrimage

Language. Pashto and Persian, divisions of the Iranian linguistic group, are the official languages of Afghanistan Although Pashto has quite an extensive literature, Persian is used for cultural expression and business and government transactions Of the many dialects spoken, the Turkish Uzbek, Turkoman, and Kirghiz are most prevalent in the border regions

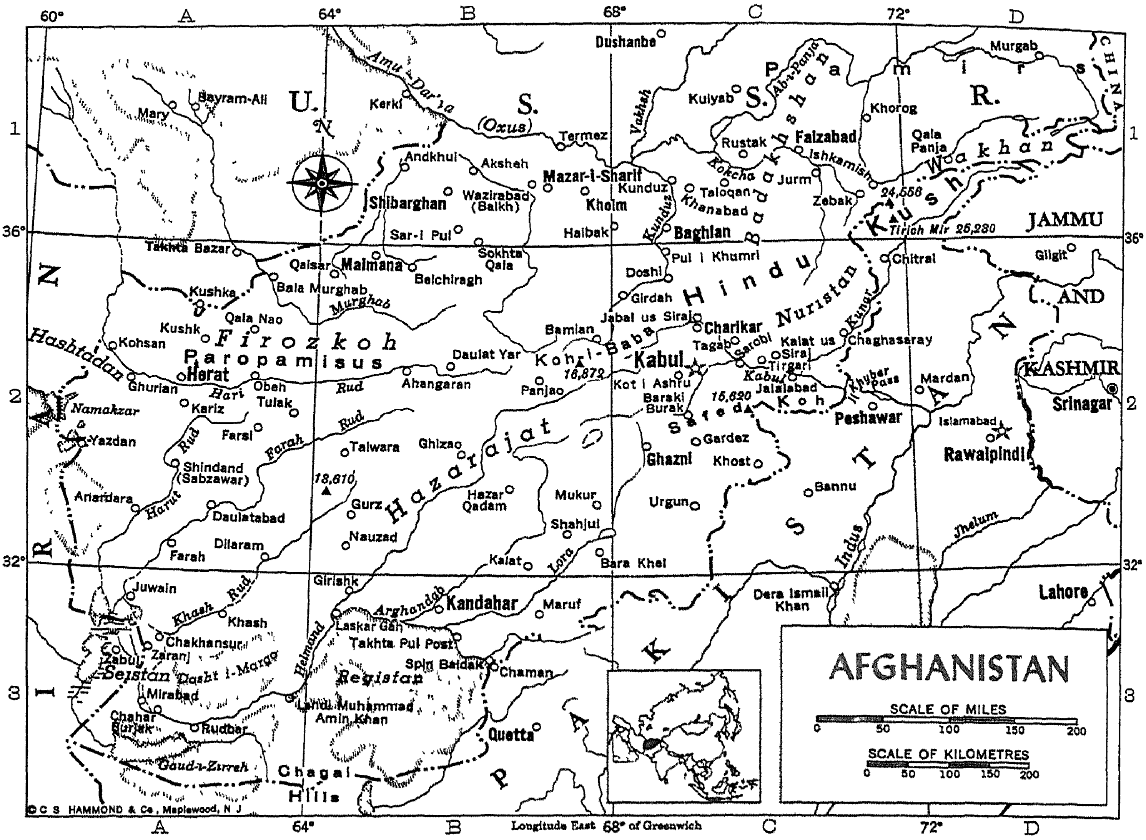
Education. Although elementary schooling is free and compulsory for children aged five through eleven, the illiteracy rate continues to be about 90 percent In the early 1970's, according to the latest available statistics, elementary schools had an annual enrollment of about 621,400; secondary schools enrolled about 172,300 annually. Institutions of higher education had an enrollment of some 9400 students The University of Kabul, founded in 1932, comprises nine graduate faculties The only other university, Nangarhar, located in Jalalabad, has only a medical faculty. A polytechnic institute was opened in Kabul in 1968

Libraries and Museums. The few major libraries are maintained by the government The Kabul Museum, largest in the country, is best known for its collection of early Buddhist relics.

Archeology. Evidence of Stone Age man has been found in caves near the ancient region of Balkh in the N. Relics from the later Iron Age (after 1000 B C) have also been found in this area In the S.E , traces of a pottery-making people who flourished about 3000-2000 B C. have been discovered. A temple in the N.E city of Baghlan, dating from the 1st century B C, was built by the ancient Kushans

Literature. The ancient art of storytelling continues to flourish in Afghanistan largely as a result of the widespread illiteracy. The Afghanistan Historical Society and the Pashto Academy, however, publish literary magazines and encourage new writers.

Art, Music, and Sports. Afghan cultural life is characterized by traditional arts and pastimes. Gold and silver jewelry, rugs in the Persian style, and various leather goods are still made at home. Music has changed little over the years and is represented chiefly by traditional



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folksongs, ballads, and dances The *attan* is the national dance. It is performed in a very large circle with the dancers clapping their hands and quickening the movements of their feet to the beat of the music. Popular sports include polo; *ghosai*, a team sport similar to wrestling; and *buzkashi*, a goal game that utilizes an animal carcass in place of a ball or puck

THE ECONOMY

The economy of Afghanistan is based on private ownership, modified by a limited form of socialism A series of five-year plans for the development of industry, agriculture, mining, transportation, and social services was initiated in 1962. All mineral resources are owned by the state. Foreign-aid grants have been received from the United States, West Germany, the U.S S R., and Communist China In a recent year the national budget showed revenues of about $156,000,000 and expenditures of about $145,000,000

About 70 percent of the population is engaged in animal husbandry or the cultivation of crops The two most pressing labor problems are widespread unemployment and a lack of skilled workers and administrators.

Agriculture. Agriculture is the main source of income in Afghanistan, the country usually produces enough food products for its own needs and a surplus for export The leading crops are cereals, garden vegetables, various fruits, and nuts The major industrial crops are castor beans, madder, asafetida, tobacco, cotton, and sugar beets. Sheep raising, the most important pastoral industry, provides large quantities of meat, fats, and wool for domestic consumption and wool and hides for export. The skin of the Karakul, a breed of broadtail sheep raised in large numbers in N Afghanistan, is highly valued The livestock population of the country also includes camels, horses, donkeys, cattle, and goats

Mining. Since ancient times, deposits of gold, silver, copper, beryl, and lapis lazuli have been mined in small quantities in the mountainous areas Salt has been mined in increasing quantities, and production now meets the needs of the country Coal deposits have been exploited, and production rose to an estimated 189,000 metric tons in the mid-1970's Large natural-gas deposits in N. Afghanistan are being developed with Soviet financing Gas began flowing to the U S S R in the mid-1970's Other deposits, such as iron ore, sulfur, chrome, zinc, and uranium, are still largely unexploited.

Manufacturing. During the past two decades manufacturing has greatly increased With the opening in 1965 of a large West German-owned woolen mill, the woolen-textile production was more than doubled. Among the other factories, located primarily in Kabul, are plants manufacturing textiles, the most important export product, two government-operated cement plants; a fruit-processing plant, a coal-briquetting plant; and several cotton gins. The chief cottage industry (work done at home) is the weaving of rugs.

Currency and Banking. The unit of currency, based on the silver standard, is the afghani, divided into 100 puls (45 afghanis equal U.S.$1; 1978). The Afghan State Bank acts as the central bank, issues all notes, executes government loans, and lends money to cities and to other banks The Bank Melli, a privately owned commercial bank, extends credit to individuals and business firms Many state banks give short-term loans to individuals and small businesses

Commerce and Trade. Most imports are controlled by the government or by government-controlled monopolies. Exports are largely in the hands of private industry.

Principal exports are Karakul skins (sent chiefly to the U.S), cotton, fruits, nuts, rugs, and natural gas. The leading purchasers of Afghan products are the Soviet Union, Great Britain, and India.

The Soviet Union, Japan, and India supply such imports as textiles, building materials, hardware, tea, and sugar. The U.S., West Germany, and the U S S R furnish motor vehicles, petroleum, machinery, and cement

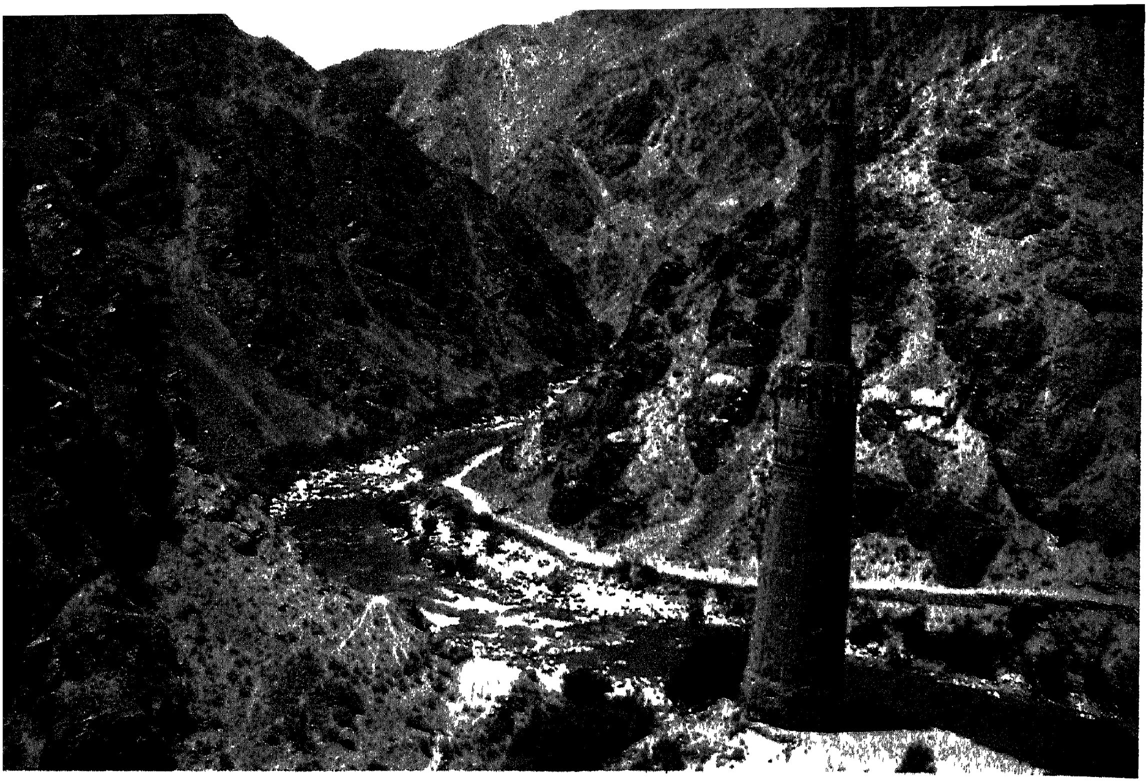
Transportation. Travel within Afghanistan is severely limited by the rugged nature of the terrain The country has no railroads, and its narrow, fast-flowing rivers are unnavigable and are used chiefly for the logging of timber. Camels and other pack animals are extensively employed for conveying goods The country has about 4200 mi of roads, of which about 3000 mi. are paved or graveled all-weather roads. Main highways link Kabul with the provincial capitals Access to Pakistan is afforded by roads that traverse the Khyber Pass. Road maintenance is a constant problem in Afghanistan, mainly because of violent spring floods. Ariana Afghan Airlines maintains service between the chief cities and neighboring countries and has flights to Frankfurt, Rome, and Moscow. Bakhtar Afghan Airlines serves remote areas of the country.

Communications. The state-controlled telephone and telegraph lines serve all principal cities and are being expanded to include smaller towns as well Telegraphic communications exist among the major cities and between Kabul and Peshawar. In the mid-1970's about 25,000 telephones were in use.

Afghanistan had fifteen daily newspapers in the mid-1970's, and one radio broadcasting station, Radio Kabul, was in operation

GOVERNMENT

A republican constitution promulgated in February, 1977, vested broad powers in the president of Afghanistan, legalized only one political party, and established Islam as the state religion The constitution was suspended in April, 1978, following a coup d'etat, and a Revolutionary Council became the country's chief governing body.



At Jam, in Herat Province, the world's second highest minaret (65 m) stands on a bank of the Hari Rud

F Jackson-Bruce Coleman, Inc

Health and Welfare. The government has greatly increased its efforts to provide for the welfare of the people in recent years A program of preventive medicine against communicable diseases is well under way. Many more hospitals and public health clinics have been built and staffed, and students have been encouraged to enter the field of medicine

Legislature. Legislative power is vested in a parliament (*Shura*), consisting of an upper house (House of the Elders) and a lower house (House of the People).

Under the 1977 constitution the powers of both houses of parliament were considerably restricted.

Local Government. Each province is administered by a governor appointed by the prime minister and approved by parliament, and by a popularly elected provincial council. A Grand National Council (*Loya Jirgah*), consisting of the members of parliament and the chairmen of the provincial councils, may be convened during times of national crisis. It was the *Loya Jirgah,* convened on Jan 30, 1977, for the first time since the 1973 coup d'etat, that approved the new constitution and elected Mohammad Daud Khan (1908-78) president for a six-year term.

Judiciary. Afghan law is based upon the constitution, legislative enactments, and the traditional tenets of Islamic law. The judiciary consists of a Supreme Court and lower courts.

Defense. All male citizens from twenty to forty-two years of age may be conscripted into the army for a period of two years In peacetime the army numbers about 90,000 In addition, the country has a small air force

HISTORY

In ancient times the region now known as Afghanistan was the site of a culture that flourished in the 2nd millennium B.C The center of this civilization was Bactria (q v), where the Persian prophet Zoroaster (q v) is believed to have been active about 660 B.C. The region first appeared in recorded history in 516 B C., when it was conquered by the Persian emperor Cyrus the Great (q.v.) Along with the rest of the Persian Empire, the land was subjugated, about 334-333 B.C., by the Macedonian ruler Alexander the Great (*see* ALEXANDER III). After his death (323 B.C.) most of the region fell under the domination of the Seleucid ruler Seleucus Nicator (358?-280 B.C.) and later under that of the Indian king Chandragupta Sandrocottus (322?-298 B.C.). Later another Greek dynasty established itself in Bactria and founded a state that lasted from 246 B C. until about 130 B C The Greco-Bactrian state yielded in turn to Iranian nomads called the Sakas or Sacae and then to the Kushans, who adopted Buddhism (q.v) In the 3rd and 4th centuries A D. the Sassanian Persians invaded the country from the west The Ephthalites, or White Huns, were largely in control of Afghanistan when a large migration of Arabs swept over the region in the middle of the 7th century

Early Arab Period. Arab penetration affected Afghanistan probably more decisively than any previous foreign influence Centuries passed, however, before Islam became the dominant religion Arab political control was superseded meanwhile by Persian and Turkish rule Complete Turkish ascendancy in the area was established late in the 10th century and early in the 11th century by the Muslim sultan Mahmud of Ghazni (971?-1030). Islamic culture subsequently achieved brilliant heights under the reputedly native Afghan Ghuri dynasty (1148-1215) The Ghurids gradually extended their rule into northern India, but were overwhelmed by the hordes of the Mongol conqueror Genghis Khan (q v.), who came down from the north about 1220 Most of the country remained under Mongol control until the close of the 14th century, when another Mongol invader, Tamerlane (q v.), seized northern Afghanistan Among Tamerlane's most prominent successors was Baber (q v), founder of the Mogul (Mongol) dynasty of India, who conquered Kabul about 1504 Later in the 16th century Safawids from Persia and Uzbeks from the north made inroads in the region However, the Persians and the Mogul successors of Baber were faced with continuous Afghan revolts.

During the 17th century, the native Afghans began to grow in power. A Ghilzai tribe conquered the Persian capital of Isfahan in 1722. Subsequently, a vigorous Persian counteroffensive was launched by the Persian king Nadir Shah (1688-1747), who in 1738 reestablished Persian authority over virtually all of Afghanistan. Nadir was assassinated in 1747, whereupon the Afghan chiefs selected one of his generals, a member of the Abdali tribe named Ahmad Shah (1722?-72?), as their ruler Ahmad Shah became known as Durrii-Dauran ("Pearl of the Age") The Abdali were thus designated thereafter as the Durani Ahmad Shah substantially enlarged his realm, acquiring eastern Persia, Baluchistan, Kashmir, and part of the Punjab However, the emirate disintegrated under the succeeding rulers of his dynasty, falling in 1818. Anarchy prevailed in Afghanistan during the ensuing period In 1826 Dost Mohammed Khan (1793-1863), a member of a prominent Afghan family, seized control of eastern Afghanistan, assuming the title of emir in 1835.

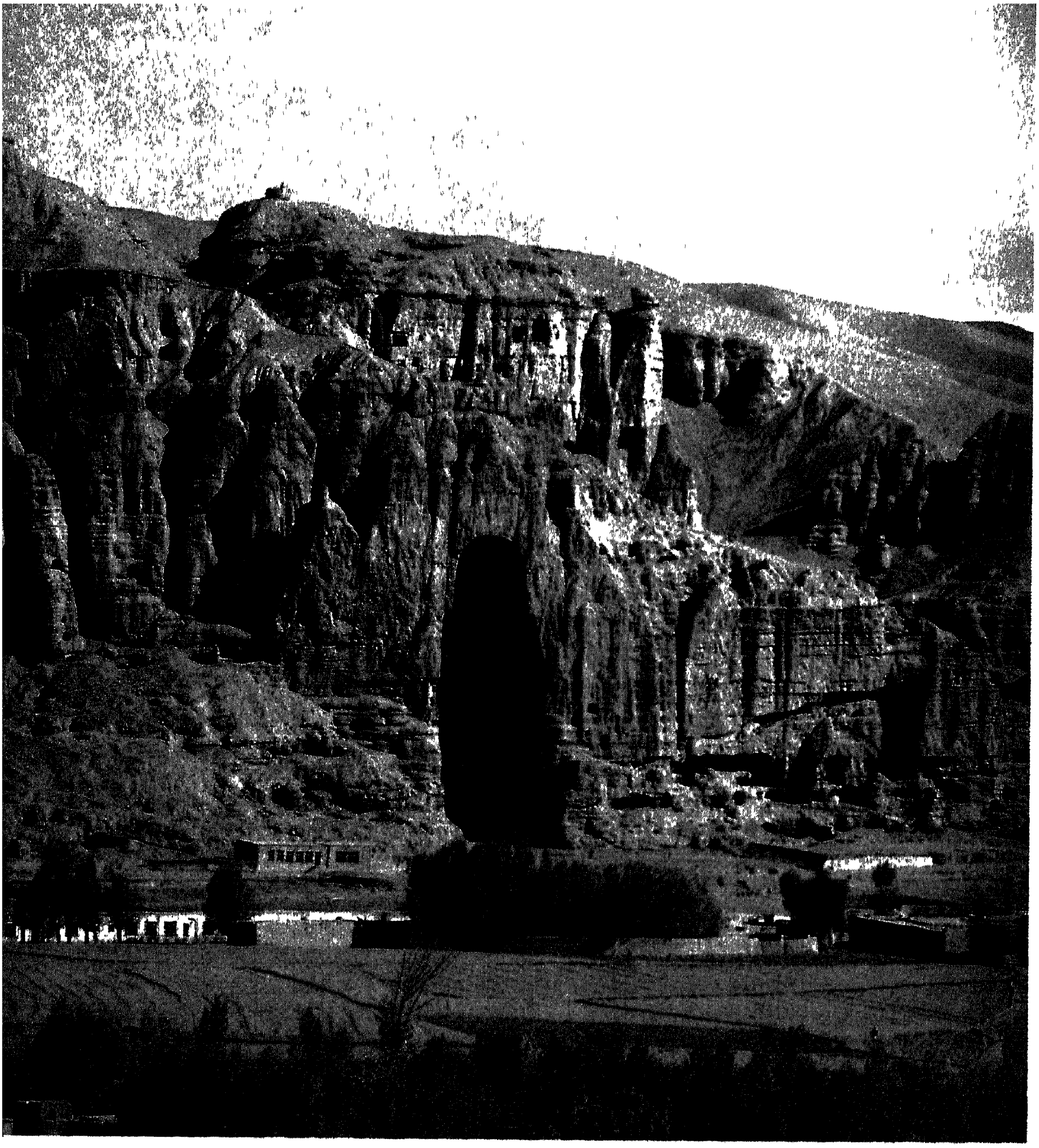
The Afghan Wars. Meanwhile, Dost Mohammed had appealed to British colonial authorities in India for support of Afghan territorial claims in the Punjab The British rejected his appeal, and Dost Mohammed turned to Russia for help Fearful that the Russian sphere of influence would be extended to the Indian frontiers, the British governor-general in India, George Eden, Earl of Auckland (1784-1849), presented Dost Mohammed with an ultimatum that included demands for the expulsion of a Russian representative at Kabul These British demands were refused, and in March, 1838, an Anglo-Indian army invaded Afghanistan, precipitating the First Afghan War (1838-42) Meeting little effective opposition, the invaders captured Kandahar in April, 1839, and Ghazi the following July When Kabul fell on Aug. 7, Shah Shuja (1780?-1842), a grandson of Ahmad Shah, was installed on the Afghan throne in place of Dost Mohammed, who gave himself up to the British

On Nov. 2, 1841, Akbar Khan (d 1849), a son of Dost Mohammed, led a successful revolt against Shah Shuja and the Anglo-Indian garrisons in the country An Anglo-Indian punitive expedition reinforced the garrisons for a brief period, but in December, 1842, the British finally left the country. Dost Mohammed was then released from custody and allowed to resume his throne.

Relations between Afghanistan and British-held India remained tense until 1855, when Dost Mohammed concluded a peace agreement with the Indian government.

Fratricidal strife among the emir's sons kept the country in turmoil for more than a decade after his death in 1863 Shere Ali Khan (1825-79), his son and successor, aroused the enmity of the British by adopting a friendly policy toward Russia in 1878. Another British ultimatum was ignored, and in November, 1878, Anglo-Indian forces again invaded Afghanistan In the course of the ensuing conflict, known as the Second Afghan War (1878-79), the Afghans suffered a series of severe reversals Kabul was occupied in October, 1879, Yakub Khan (1849-1923), son of Shere Ali who had succeeded to the throne in the preceding March, was forced to abdicate, and, in 1880, Abd-er-Rahman Khan (1830?-1901), grandson of Dost Mohammed, was placed on the throne. The new ruler confirmed the cession, previously arranged with the British by Yakub Khan, of the Khyber Pass and other Afghan territories During his reign, which lasted until 1901, Abd-er-Rahman Khan adjusted boundary disputes with India and Russia, created a standing army, and curbed the power of various tribal chieftains

In 1907, during the reign of Habibullah Khan (1872-1919), the son and successor of Abd-er-



A gigantic Buddha, carved from a cliff of the Hindu Kush range. It is part of an ancient monastery excavated in Bamian Peter Jackson-Bruce Coleman, Inc.

Rahman, the British and Russian governments concluded a convention pledging mutual respect for the territorial integrity of Afghanistan. Habibullah was assassinated in February, 1919 His brother Nasrullah Khan, who held the throne for only six days, was deposed by the Afghan nobility in favor of Amanullah Khan (1892–1960), a nephew of Habibullah. Determined to remove his country completely from the British sphere of influence, Amanullah declared war on Great Britain in May, 1919 The British, faced at the same time with the growing Indian liberation movement, negotiated a peace treaty with Afghanistan the following August By the terms of this agreement, concluded at Rawalpindi, Great Britain recognized Afghanistan as a sovereign and independent nation In 1926 Amanullah Khan changed his title from "emir" to "king".

The New Kingdom. The popularity and prestige which King Amanullah had won through his handling of the British were soon to be dissipated. Deeply impressed by the modernization programs of Iran and Turkey, he instituted a series of political, social, and religious reforms in his kingdom. Constitutional rule was inaugurated (1923), the titles of the nobility were abolished, education for women was decreed, and other sweeping measures aimed at the modernization of traditional institutions were enforced The profound hostility provoked in influential circles in Afghanistan by the king's reform program led, in 1929, to rebellion, and Amanullah quickly abdicated and went into exile. His brother Inayatullah, who succeeded him, was deposed, after a reign of three days, by Bacha Sakau, a rebel leader In October, 1929, Amanullah's uncle, Nadir Shah (1880–1933), with the support of several thousand tribesmen, defeated the forces of Bacha Sakau, who was captured and executed The Afghan crown was then bestowed on Nadir Shah

The new ruler gradually restored order in the kingdom In 1932 he initiated a program of economic reforms, but he was assassinated the following year His son and successor, Zahir Shah (1914–), nineteen years old at the time of his accession, was dominated for the next thirty years by his uncles and cousins, particularly by his cousin and later brother-in-law, Prince Mohammad Daud Khan (1908–78), who served as premier from 1953 to 1963 The government intensified the modernization program begun by Nadir Shah and established close commercial relations with Germany, Italy, and Japan Zahir Shah proclaimed neutrality at the outbreak of World War II, however, in 1941, at the request of Great Britain and the Soviet Union, more than 200 German and Italian agents were expelled from the country The United States established diplomatic relations with Afghanistan in 1942. In November, 1946, Afghanistan became a member of the United Nations.

International Events. The Afghan government closely scrutinized the events attendant upon the establishment in 1947 of India and Pakistan as independent states. Of particular concern was the incorporation into Pakistan of the North-West Frontier Province (q v) Tribal Areas, a neighboring region largely populated by Pathans Pakistan ignored Afghan demands for a plebiscite in the Tribal Areas on the question of self-determination In retaliation, Afghanistan voted (1947) against the admission of Pakistan to the U N Relations between the two countries continued to be strained during the next several years Sporadic frontier clashes occurred between Pakistani forces and Pathan tribesmen, especially after 1949, when the latter, with the approval of the Afghan government, launched a movement to establish an independent state to be called Pashtunistan or Pathanistan

Afghanistan manifested displeasure over a U S -Pakistan military-aid pact concluded in 1954 The following year Soviet Premier Nikolai A Bulganin (q.v), visiting Afghanistan, proclaimed support for a state of Pashtunistan Subsequently the U S S.R and Afghanistan issued a joint statement advocating peaceful coexistence, universal disarmament, and U N membership for Communist China The Soviet government simultaneously extended technical-aid loans to Afghanistan

Relations between Pakistan and Afghanistan improved briefly during the late 1950's In 1961, however, the Pashtunistan dispute again flared up, and diplomatic relations were broken off, not to be fully restored until 1967

In 1963 King Zahir removed Mohammad Daud as premier and took full control of the reins of government In 1964 Afghanistan became a member of the Colombo Plan for Cooperative Economic Development in South and Southeast Asia A new constitution providing for a more liberal form of government became effective in October, 1964, simultaneously, parliament was dissolved The first legislative elections under the new constitution were held in September, 1965

In 1966 the Afghan ambassador to the U N , Abdul Rahman Pazhwak (1919–), was elected president of the General Assembly for the twenty-first session

In the Arab-Israeli War of 1967 (*see* MIDDLE EAST) and subsequent disputes, particularly in regard to the Israeli occupation of old Jerusalem, Afghanistan generally supported the Arabs

Despite efforts at reform and modernization in the late 1960's, Afghanistan remained in serious economic difficulties The situation was worsened by three years of drought, during which 80,000 persons are believed to have died of starvation By 1973 aid from the Soviet Union had reached $1,500,000,000, from the U.S , $425,000,000, and from China, $72,000,000

In 1968 King Zahir had made overtures to Daud, and a degree of harmony was believed to have been restored On July 17, 1973, however, while the king was vacationing abroad, Daud declared martial law, proclaimed Afghanistan a republic, and vowed to replace the "corrupt" government of Zahir with "genuine democracy"

A new constitution was approved in early 1977, and Daud was elected to the powerful post of president. He appointed a civilian cabinet and maintained the country's policy of nonalignment In April, 1978, Daud was killed during a violent coup d'etat. The new rulers, organized in a Revolutionary Council led by Noor Mohammad Taraki (1917?–), suspended the constitution and promised to raise general living standards

AFRICA, the second-largest continent, with adjacent islands covers about 20 percent of the total land area in the world Estimates of its size range from 11,300,000 sq mi to 12,563,000 sq.mi Africa is bounded by the Strait of Gibraltar on the N.W, the Mediterranean Sea on the N., the Red Sea and the Gulf of Aden on the N E, the Indian Ocean on the E, the Indian and Atlantic oceans on the S, and the Atlantic Ocean on the W and N W. It is joined to Asia at the Isthmus of Suez, which separates the Mediterranean and Red seas, *see* SUEZ CANAL

From Ras ben Sekka, near Cape Blanc, in Tunisia (lat. 37°14′ N.), the northernmost point in Africa, to Cape Agulhas in South Africa (lat 34°50′ S), the southernmost point, the distance is 4970 mi The maximum width of the continent, measured from Pointe des Almadies, on Cape Vert in Senegal (long 17°30′ W), to Ras Hafun, near Cape Guardafui in Somalia (long 51°25′ E), is 4700 mi Latitudinally, the continent is almost equally divided between the Northern and Southern hemispheres and lies almost entirely within the tropics Because of the west African bulge, the greater part of the area of the continent lies N of the equator. The highest point on the continent is Mt Kilimanjaro, 19,340 ft, in Tanzania, and the lowest point is the Qattâra Depression, a rugged valley 436 ft below sea level, in the Arab Republic of Egypt.

Africa has an extremely regular coastline with a total length of only 18,950 mi. Because of the relatively small number of large gulfs, bays, or other coastal indentations, the length of the coastline is proportionately less than that of any other continent. Major bays or promontories include, in addition to those already cited, the Gulf of Guinea, a great inlet of the Atlantic Ocean on the W central coast, including the Benin and Biafra bights, Cape Lopez, the Cape of Good Hope; Delagoa Bay, an inlet of the Indian Ocean in Mozambique, Mozambique Channel, a strait between Madagascar and the S.E. part of the mainland, and the Gulf of Sidra and the Gulf of Gabès in the Mediterranean Sea

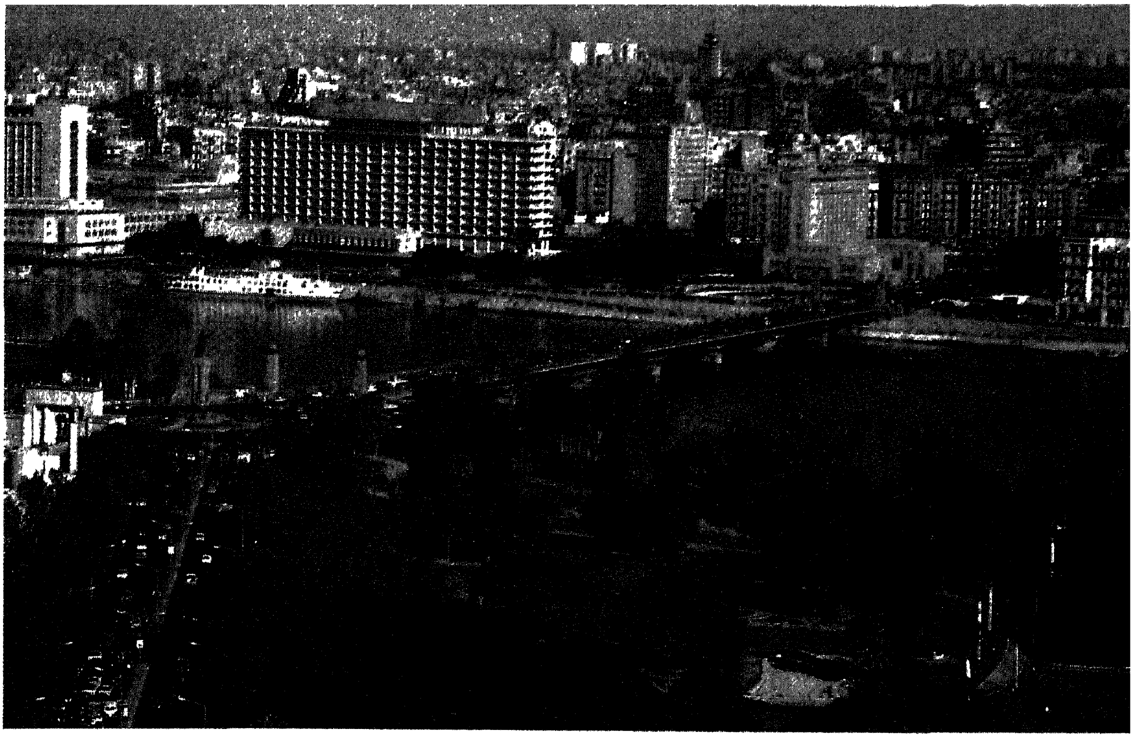
The chief islands of Africa, which have a combined area of some 240,000 sq.mi., include Madagascar, Zanzibar, Pemba, Mauritius, Réunion, the Seychelles, and the Comoro Islands in the Indian Ocean, São Tomé, Príncipe, Annobón, and Macías Nguema Biyogo in the Gulf of Guinea, Saint Helena, Ascension, and the Bissagos Islands in the Atlantic Ocean, and the Cape Verde, Canary, and Madeira island groups in the North Atlantic

CHIEF POLITICAL DIVISIONS OF AFRICA

Political Unit	Political Status
Algeria	Republic
Angola	Republic
Benin (former Dahomey)	Republic
Botswana	Republic within Commonwealth
Burundi	Republic
Cameroon	Republic
Canary Islands	2 provinces of Spain
Cape Verde	Republic
Central African Empire	Constitutional monarchy
Ceuta	Part of Spanish province (in Morocco) of Cádiz
Chad	Republic
Comoro Islands	Republic
Congo, People's Republic of (former Middle Congo)	Republic
Djibouti (former French Territory of the Afars and the Issas)	Republic
Egypt, Arab Republic of (former United Arab Republic)	Republic
Equatorial Guinea	Republic
Ethiopia	Republic
Gabon	Republic
Gambia	Republic within Commonwealth
Ghana	Republic within Commonwealth
Guinea	Republic
Guinea-Bissau (former Portuguese Guinea)	Republic
Ivory Coast	Republic
Kenya	Republic within Commonwealth
Lesotho	Independent monarchy within Commonwealth
Liberia	Republic
Libyan Arab Republic	Republic
Madagascar (former Malagasy Republic)	Republic
Madeira	Constitutes Funchal district of Portugal
Malawi	Republic within Commonwealth
Mali	Republic
Mauritania	Republic
Mauritius	Independent member of Commonwealth
Melilla	Part of Spanish province (in Morocco) of Málaga
Morocco	Constitutional monarchy
Mozambique	Republic
Niger	Republic
Nigeria	Republic within Commonwealth
Réunion	Overseas department of France
Rhodesia (Zimbabwe)	British dependency; declared unilateral independence, 1965
Rwanda	Republic
St. Helena	British dependency
São Tomé and Príncipe	Republic
Senegal	Republic
Seychelles	Republic within Commonwealth
Sierra Leone	Republic within Commonwealth
Somalia	Republic
South Africa	Republic
South-West Africa (Namibia)	Administered by Republic of South Africa
Sudan	Republic
Swaziland	Independent monarchy within Commonwealth
Tanzania	Republic within Commonwealth
Togo	Republic
Tunisia	Republic
Uganda	Republic within Commonwealth
Upper Volta	Republic
Zaire (former Democratic Republic of the Congo and Belgian Congo)	Republic
Zambia	Republic within Commonwealth

THE LAND

Except for the N. coast and the Atlas Mountains



Cairo, Egypt, the foremost African metropolis, seen from the island of az-Zamālik in the Nile River, which flows through the city. J. G. Ross-Photo Researchers, Inc.

(q.v.) in the N.W., the terrain of Africa consists of a vast plateau. Although the plateau appears to be rolling, it is marked by a number of large, saucer-shaped basins. Despite the uniformity of vast areas, several regions have highly distinctive features.

Principal Regions. Africa may be divided into three major regions, namely the Northern Plateau, the Central and Southern Plateau, and the Eastern Highlands. The outstanding feature of the Northern Plateau is the Sahara (q.v.), the great desert that extends from the Atlas Mts. and the Atlantic coast to the Red Sea and that occupies more than one quarter of the entire continent. The Sudan region, some 2,000,000 sq.mi. in area and extending from the W. African coast to the Eastern Highlands, occupies the S. portion of the Northern Plateau. This area consists of grassy flatlands and well-watered plains. The Central and Southern Plateau is considerably higher than the Northern Plateau and occupies the entire region W. of the Eastern Highlands. The Eastern Highlands, highest portion of the continent, lie near the E. coast, extending from the Zambezi River (q.v.) northward to the Red Sea. The Drakensberg Mountains (q.v.) may be considered a southern spur of these highlands. The tableland bordering the Red Sea and a high plateau jutting into the Somali Peninsula are regarded as spurs of the Eastern Highlands.

Relief. The elevation of the African plateau increases from N.W. to S.E., the average being about 1900 ft. Coastal strips, with the exception of the Mediterranean coast and the Guinea coast, are generally narrow and rise sharply to the plateau.

In N. Africa, the Atlas Mts., a chain of rugged peaks linked by high plateaus, run from Morocco into Tunisia. The highest point is Djebel Toubkal (13,665 ft.) in S.W. Morocco. The main highlands in the Northern Plateau are the Tibesti Mts., of the central Sahara, which reach a maximum elevation of 11,204 ft. The Qattâra Depression is the lowest point of the region, 436 ft. below sea level. In the Sudan region the most prominent highlands are the Futa Jallon, the Adamawa Massif, and the Cameroon mountain range, which reaches a maximum elevation of 13,350 ft. at Mt. Cameroon. To the N. is the Lake Chad basin. The Central and Southern Plateau contains several major depressions, notably the Congo River basin and the Kalahari Desert (q.v.). Other features of this plateau, which averages more than 3000 ft. in elevation, are Makalakari and Ngami, saline basins, the Drakensberg range, running some 700 mi. in a N. to S. direction, and, in the extreme S., the Karoo (q.v.), an arid plateau covering more than 100,000 sq.mi.

Much of the Eastern Highlands has an average elevation of more than 5000 ft., in the Ethiopian Plateau it rises to levels of 6000 ft., 8000 ft., and 10,000 ft. Ras Dashan (15,157 ft.) is the highest peak of the plateau. South of the plateau are a number of towering volcanic peaks, including Mt. Kilimanjaro; Mt. Kenya (17,058 ft.); and Mt.

With Africa's loftiest peak, Mt Kilimanjaro, as background, a herd of elephants forages near the Kenya-Tanzania border Herbert Lanks-Monkmeyer Press Photo

Elgon (14,178 ft) A distinctive topographical feature is the system of rift valleys that traverses the highlands in a N to S direction This system, a result of subsidence of the terrain between parallel cracks in the crust of the earth, comprises a series of narrow, elongated depressions with steep walls West of the rift valleys is the Ruwenzori (q v), a mountain range between lakes Albert and Edward, which attains a maximum elevation of 16,795 ft

The topography of Madagascar features a rugged central highland running N E to S W along the E coast Mount Maromokotoro (9436 ft) is the highest point on the island

Drainage. Six major drainage networks exist in Africa, with the exception of the Lake Chad basin, all have outlets to the sea and all are cut by steep cataracts or rapids that impede navigation The Nile River (q v), with a length of 4132 mi., is the longest river in the world Formed from the Blue Nile, originating at Lake Tana in Ethiopia, and the White Nile, originating at Lake Victoria, the Nile flows W and N before emptying into the Mediterranean Sea Its major tributaries are the 'Atbara, Bahr al-Ghazal, and Sobat The Congo River (q v), some 2900 mi long, originates in Zambia and flows N, W, and S to drain into the Atlantic Ocean Its main tributaries are the Kasai and the Ubangi The third-longest African river, the Niger, is about 2600 mi long, although its upper portions are navigable only during rainy seasons The Niger rises in the Futa Jallon and flows N and E before turning S to empty into the Gulf of Guinea Its chief tributary is the Benue R The Zambezi R, about 2200 mi long, originates in Zambia and flows S and E to empty into the Indian Ocean The Luangwa and Kafue rivers are its main tributaries The Zambezi is cut by various rapids, the most spectacular of which is Victoria Falls (q v) The Orange R, with its tributary, the Vaal, has a length of about 1300 mi It rises in the Drakensberg Mountains of Lesotho and flows W to the Atlantic Lake Chad, a freshwater lake with an average depth of about 4 ft, drains nearby rivers and constitutes the largest inland drainage area on the continent Other significant river systems include the Senegal and Volta in W Africa, and the Limpopo in S Africa

The rift valleys of the Eastern Highlands form the basins of the equatorial lake system Among the rift-valley lakes are Nyasa (*see* MALAWI, LAKE), Tanganyika, Rudolf (Turkana), Edward (qq v), and Albert Lake Victoria, the largest lake in Africa and the third largest in the world, occupies a shallow depression in the highlands

Geology. In general, the geological structure of Africa exhibits simplicity and uniformity, characterized by a basal complex of crystalline rocks supporting sediments laid down in Paleozoic, Mesozoic, and Cenozoic times (geological periods stretching from 570,000,000 to about 38,000,000 years ago) Strata of recent deposition occur only in the river valleys and coastal regions Thus, it follows that the greater part of the terrain was formed in early geological times and remained above sea level during succeeding periods

The most ancient rocks found in Africa are

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Madeira (isl.), Portugal	A 1
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Mafeking, S. Afr	E 7
Mafia (isl.) Tanzania	G 5
Mahenge, Tanzania	F 5
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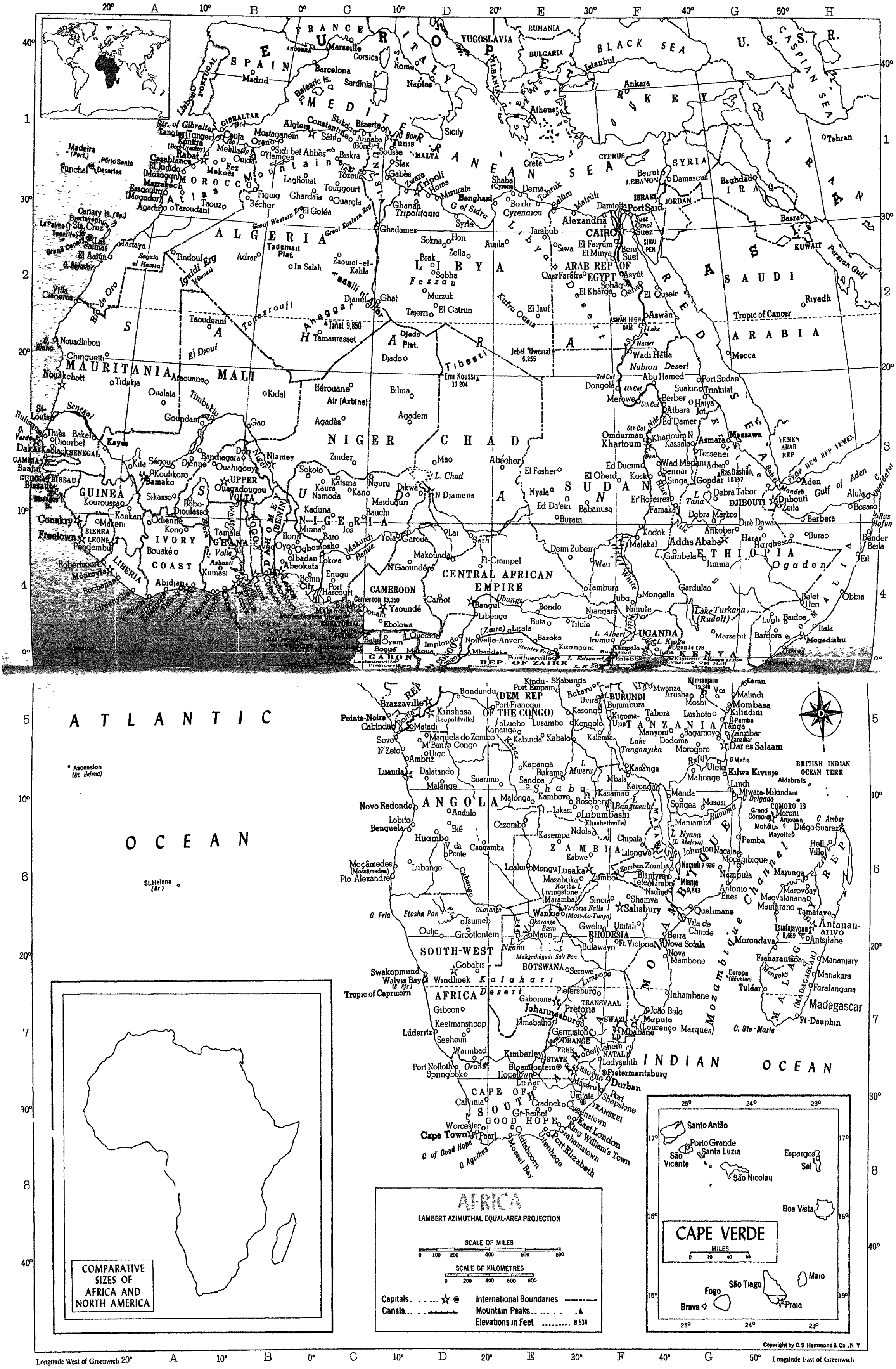
AFRICA
LAMBERT AZIMUTHAL EQUAL-AREA PROJECTION
SCALE OF MILES
0 100 200 400 600 800
SCALE OF KILOMETRES
0 200 400 600 800
Capitals ☆ ◉
Canals
International Boundaries
Mountain Peaks ▲
Elevations in Feet 8 534
COMPARATIVE SIZES OF AFRICA AND NORTH AMERICA
CAPE VERDE
MILES
Santo Antão
Porto Grande
Santa Luzia
São Vicente
São Nicolau
Espargos
Sal
Boa Vista
Maio
São Tiago
Fogo
Brava
Praia
25° 24° 23°
17° 16° 15°
Copyright by C. S. Hammond & Co., N. Y.
Longitude West of Greenwich 20°
A 10° B 0° C 10° D 20° E 30° F 40° G 50°
Longitude East of Greenwich
20° A 10° B 0° C 10° D 20° E 30° F 40° G 50° H
40° 1 30° 2 20° 3 10° 4 0° 5 10° 6 20° 7 30° 8 40°
E U R O P E
FRANCE
SPAIN
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ITALY
YUGOSLAVIA
RUMANIA
BULGARIA
ALBANIA
GREECE
BLACK SEA
U. S. S. R.
CASPIAN SEA
TURKEY
MEDITERRANEAN SEA
SYRIA
LEBANON
ISRAEL
JORDAN
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IRAN
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S A H A R A
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Cyrenaica
Ahaggar
Tibesti
Tropic of Cancer
SPANISH SAHARA
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PEOP. DEM. REP. YEMEN
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GUINEA
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IVORY COAST
UPPER VOLTA
GHANA
TOGO
DAHOMEY (BENIN)
NIGERIA
CAMEROON
CENTRAL AFRICAN EMPIRE
EQUATORIAL GUINEA
GABON
CONGO
REP. OF ZAIRE
UGANDA
KENYA
L. Chad
Lake Turkana (Rudolf)
L. Victoria
L. Albert
L. Edward
L. Kivu
L. Tanganyika
L. Mweru
L. Bangweulu
L. Nyasa (L. Malawi)
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Mt. Kenya 17,058
Ras Dashan 15,157
Emi Koussi 11,204
Tahat 9,850
Cameroon 13,350
Jebel 'Uweinat 6,255
Equator
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Ascension (St. Helena)
St. Helena (Br.)
BURUNDI
RWANDA
TANZANIA
ANGOLA
ZAMBIA
MALAWI
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Mozambique Channel
RHODESIA
BOTSWANA
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Kalahari Desert
Etosha Pan
Okavango Basin
Tropic of Capricorn
TRANSVAAL
SWAZILAND
ORANGE FREE STATE
NATAL
LESOTHO
TRANSKEI
CAPE OF GOOD HOPE
SOUTH AFRICA
C. of Good Hope
C. Agulhas
MALAGASY REP. (MADAGASCAR)
Madagascar
Antananarivo
C. Ste-Marie
C. Amber
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BRITISH INDIAN OCEAN TERR.
Aldabra Is.
INDIAN OCEAN
Cairo
Alexandria
Tripoli
Tunis
Algiers
Rabat
Casablanca
Dakar
Nouakchott
Bamako
Niamey
Ouagadougou
Conakry
Freetown
Monrovia
Abidjan
Accra
Lomé
Lagos
Porto-Novo
N'Djamena
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Brazzaville
Kinshasa
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Windhoek
Gaborone
Pretoria
Johannesburg
Maputo (Lourenço Marques)
Mbabane
Maseru
Durban
Cape Town
Port Elizabeth
East London
Kimberley
Bloemfontein
Lubumbashi
Kisangani
Mombasa
Zanzibar

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gneisses, schists, and granite, which may be classed as Archean or Precambrian (4,000,000,000 to 570,000,000 years old) Outcroppings of Precambrian rock occupy about 57 percent of the continental area. In other areas tilted, eroded horizontal beds of sandstones and slates overlie the basal complex In S Africa these beds contain rich deposits of gold and other minerals Extensive Devonian beds (395,000,000 to 345,000,000 years old), in which marine fossils are found, also occur in S Africa and in the Sahara and Sudan regions Carboniferous strata (345,000,000 to 280,000,000 years old) containing rich coal seams are widespread in the southern, southeastern, eastern, and central portions of the continent East-central Africa, particularly the Somali and Tanzanian regions, has extensive Jurassic deposits (190,000,000 to 136,000,000 years old), notably limestone, some of which are rich in reptilian and marine fossils

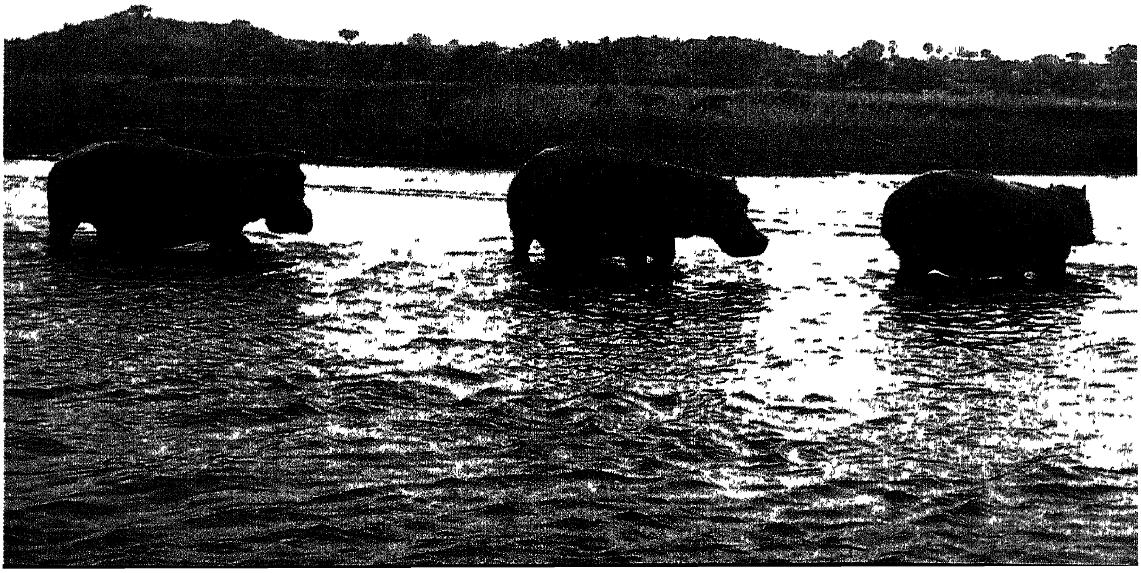
The continental terrain displays considerable evidence of ancient volcanic activity of extreme violence, especially in the E and S E uplifts Volcanic activity was probably most intense during the Jurassic period, the estimated time of subsidence of a continental area (known in geology as Gondwanaland) believed to have connected Africa to South America, India, Australia, and Antarctica Thermal phenomena still occur in Kenya and Tanzania, and in the region E of Lake Victoria many extinct volcanic cones and craters exist The diamond mines of South Africa, the richest diamond-bearing region in the world, are located in the vents of old volcanoes

Geologically, the Atlas Mts are a part of the Eurasian landmass The system is composed of eruptives, including trachyte and basalt along the N edge, with interfoliated gneisses, schists, granite, and limestone, as well as Carboniferous, Jurassic, and Triassic sediments (dating from 345,000,000 to 136,000,000 years ago)

Climate. More than any other continent, Africa is distinguished by the general uniformity of its climatic phenomena, this results from the position of the continent in the tropical zone, with the equator bisecting it, the impact of cool ocean currents, and the absence of mountain chains serving as climatic barriers

Seven main African climatic zones may be distinguished The central portion of Africa, above and below the equator, is a tropical rain forest climate zone Here, particularly in the Congo basin, which is constantly hot and moist, the average temperature is 80° F No true dry season exists, although some months have less rainfall than others The climate zone of the E African and Guinea coasts resembles the equatorial climate, except that rainfall comes mainly in one season, no months, however, are rainless, and there is no true dry season

The tropical savanna climate zone includes more than one third of Africa Here the climate has three distinct phases a cool, dry season, a hot, dry season, and a hot, wet season Total rainfall varies from 20 in on the desert margins



Hippopotamuses near Murchison Falls in northwestern Uganda Semiaquatic in nature, the animals are also called river horses William G Levy-Photo Researchers, Inc to 80 in in areas in which the savanna climate merges with that of the equatorial region The zone of low-latitude deserts and flatlands has a three-season climate, but total rainfall is under 20 in , resulting in desert or semidesert conditions Moisture-laden air masses seldom penetrate into the N region of Africa, and when such air masses do move inland, little moisture is deposited In the Sahara, extremes of temperature are great, sun temperatures of 170° F may be reached, but shade temperatures as high as 136° F are said to have been recorded During the cold season, however, the temperature often drops below freezing, frost is quite common, and the coldest month has a mean temperature below 50° F Other notable arid regions include the Kalahari Desert and the Namib Desert of S Africa

Mediterranean climate zones are found in the extreme N W of Africa and in the extreme S W Rainfall occurs during the winter months in these regions The mountain or highland climate zones are, on the whole, equable and temperate In E Africa, particularly in Kenya and Uganda, rainfall is well distributed throughout the year Temperatures are never excessive, and the air is rarefied The climate on the high plateau of South Africa is temperate, with temperatures ranging from about 50° F in winter to about 68° F in summer, the winters are dry and the summers rainy

Plant and Animal Life. Africa is well known for its diverse vegetation as well as the variety of its animal life, particularly big-game animals

PLANTS African vegetation can be classified according to rainfall and humidity zones The tropical rain forest zone, where the average annual rainfall is more than 50 in , has a dense surface covering of shrubs, ferns, and mosses, above which tower evergreens, oil palms, and hardwood trees, such as mahogany and ebony, some of which reach heights of 150 ft or more A mountain forest zone, with average annual rainfall only slightly less than in the tropical rain forests, is found in the high mountains of Cameroon, Angola, E Africa, and parts of Ethiopia. Here a ground covering of shrubs gives way to oil palms, hardwood trees, and primitive conifers

A woodland zone, with annual rainfall of 55 in to 35 in , covers vast areas with a layer of grass and fire-resistant shrubs, above which are to be found deciduous and leguminous fire-resistant trees A wooded grassland zone, with annual rainfall of 35 in to 20 in , is covered by low

Most of the lions of the world dwell in the grasslands of sub-Saharan Africa This male roams the Serengeti Plain of northern Tanzania, a land rich in wildlife

George Schaller–Bruce Coleman, Inc

Elephants in a water hole at Savuti, Botswana, in southern Africa, imbibe part of their daily requirement 50 gal
C Haagner-Bruce Coleman, Inc

grasses and shrubs and scattered, small deciduous trees The thornbush zone, with an annual rainfall of 20 in to 12 in, has a thinner grass covering and a scattering of succulent or semisucculent trees, notably the baobab, euphorbia, and acacia

The subdesert scrub zone, with an annual rainfall of 12 in to 5 in, has a covering of grasses and scattered low shrubs The zone of desert vegetation, found in areas with an annual rainfall of less than 5 in, has sparse vegetation or none at all Desert grasses, thorny shrubs, desert bushes, and date palms grow near oases, elsewhere, small plants with deep root systems predominate A variety of short-lived plants spring up after desert rainfalls from seeds that lie dormant between storms

Other forms of vegetation include the sudd, a mass of floating papyrus, reeds, and other water plants found in the Sudanese Nile, swamps and mangrove forests found along the coasts of W and east-central Africa, thick growths of water-retaining shrubs found in N W Africa and in the Cape of Good Hope region, and mountain vegetation, such as tussock grasses, found in areas of E Africa and Ethiopia above 10,000 ft

ANIMALS Africa has two distinct zones of animal life the North and Northwestern zone, including the Sahara, and the Ethiopian zone, including all of Africa S of the Sahara The North and Northwestern zone is characterized by animal life similar to that of Eurasia Sheep, goats, horses, and camels are common domestic animals Barbary sheep, African red deer, and two types of ibex are native to the N African coast Desert foxes are found in the Sahara along with gazelles, hares, and the jerboa, a small leaping rodent. The Ethiopian zone is famous for its variety of distinctive animals and birds Woodland and grassland areas are inhabited by numerous species of antelope and deer, zebra, giraffe, buffalo, the African elephant, warthog and other species of pig, rhinoceros, and the baboon and

Terraced farmland in western Uganda Agriculture is the backbone of Uganda's economy—and that of the continent in general S Trevor-D B -Bruce Coleman, Inc

various monkeys, all of these animals are vegetable eaters Carnivores, or meat-eating animals, include the lion, leopard, cheetah, hyena, jackal, and mongoose The dense rain forests of equatorial Africa are inhabited by animals adapted to living in trees The gorilla, the largest ape in the world, is to be found here as are monkeys, flying squirrels, bats, and lemurs

Most of the bird life belong to Old World groups, among the distinctive birds are the bateleur eagle and other birds of prey The guinea fowl is a leading game bird Water birds, notably pelicans, goliath herons, flamingos, storks, and egrets congregate in great numbers The ibis is common in the Nile region, and the ostrich is occasionally seen in E and S Africa Reptiles are mainly of Old World origin and include lizards, crocodiles, and tortoises A variety of venomous snakes, including the mamba, are encountered throughout the Ethiopian zone. Among the constricting snakes, pythons occur mainly in W Africa, while boa constrictors are indigenous only to Madagascar Freshwater fish abound, with more than 2000 species known The coelacanth, an ocean fish believed extinct for some 70,000,000 years, has been found extant off the SE coast The continent has a variety of destructive insects, notably mosquitoes, which carry malaria, yellow fever, and elephantiasis, driver ants, termites, locusts, and tsetse flies The last named transmit sleeping sickness to humans and animals (in animals, the disease is called nagana)

Excessive hunting, encroaching agriculture, and new diseases, notably rinderpest, have seriously depleted a variety of African animal species In an attempt to preserve wildlife, numerous game reserves and parks have been established Found mainly in S and E Africa, the best known of these include Kruger, Tsavo, Serengeti, and Kafue national parks

Natural Resources. Africa has a surprising variety of mineral and hydrologic resources, which are beginning to be systematically exploited The soil, however, upon which the bulk of Africans must rely for subsistence is of uneven quality

SOILS Because much of the continent has been above water for millions of years, soils have developed locally and few areas have benefited

Completed in 1965, this 380-ft-high dam on the Volta River near Akosombo, Ghana, is a major source of hydroelectric power Jacques Jangoux-Peter Arnold, Inc

from transported soils brought by rivers or ocean currents The mineral fragments in African soils are angular and jagged, unlike those in transported soils, and the splintery fragments cause rapid wear to plows and other farming implements

Whenever African soils developed on sedimentary rocks, such as sandstones and shales, they resemble soils of other regions, but where they developed on ancient metamorphic rocks, weathering takes place to varied depths, drainage is irregular, and no definite water table exists The laterite soils of Africa are relatively infertile, some forming bricklike masses when dry Heavy rainfall and high temperatures leach minerals from such soil and lead to more rapid depletion of fertility In addition, heavy downpours result in serious erosion Because the natural processes of leaching and sedimentation result in the formation of hardpan at varying distances from the surface, root formation of plants is often limited African soils as a whole are not naturally rich in either organic or inorganic plant nutrients Humus is easily lost by exposure to the atmosphere, and, consequently, a single deep plowing may dissipate many of the nutrients contained in the soil Desert soils are unproductive except in oases or irrigated areas and when an effort is made to reduce their salinity The most fertile African soils include the chernozems and black soils of E Africa and the "prairie" soils of portions of W and S. Africa These soils are found in areas of moderate rainfall

MINERALS Most of the known minerals of the world are present in Africa, many in significant quantities Fossil fuels exist in abundance, although the largest African deposits of coal are in S Africa, N Africa and Nigeria have major deposits Petroleum has been found throughout N Africa, along the W African coast, in the Gabon basin, the People's Republic of the Congo, and Angola Natural gas deposits are concentrated in N and W Africa, indeed, Algeria has the largest known reserves in the world About one third of the uranium in the non-Communist world is mined in Africa, chiefly in South Africa, Niger, Zaire, Central African Empire, and Gabon Thorium is scattered through W, S, and E Africa, with major deposits in South Africa The largest radium supply in the world is located in Zaire Iron ore deposits exist throughout the continent, and major world reserves are concentrated in Algeria, Mauritania, Liberia, Gabon, Zaire, Angola, Rhodesia and South Africa. Most chromium comes from Rhodesia and South Africa, and Gabon has one of the largest manganese reserves in the world Burundi is thought to have one of the largest nickel deposits

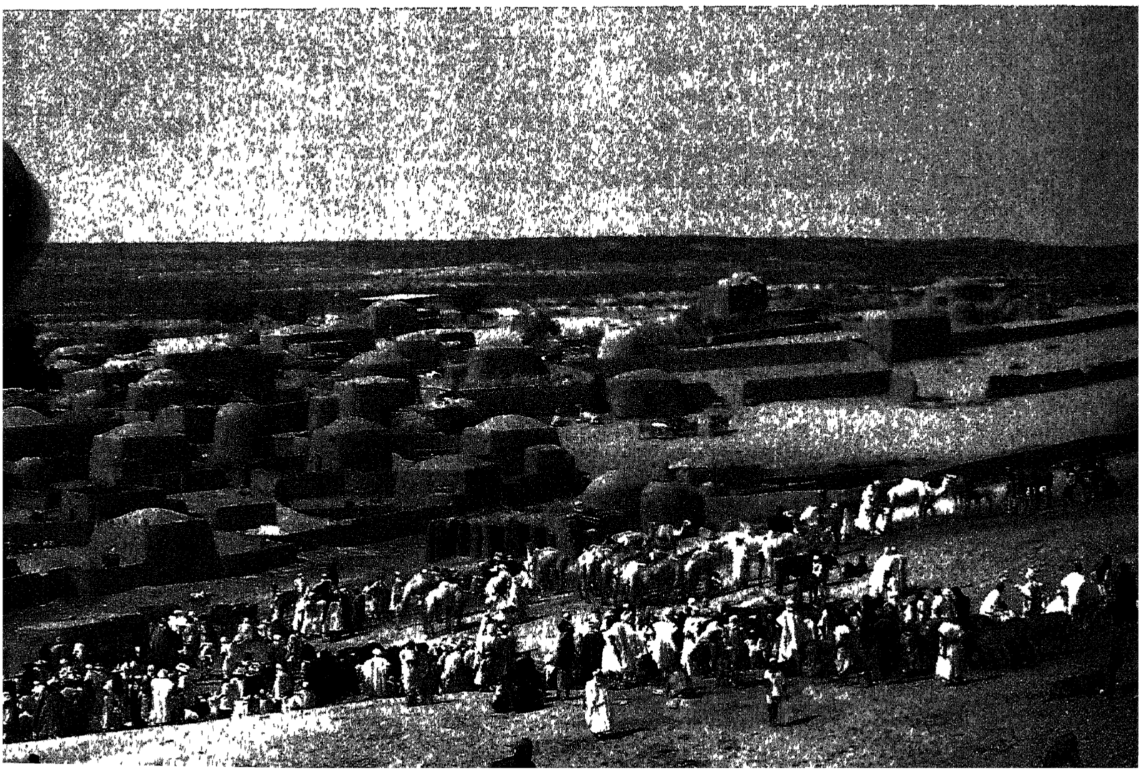
Some 20 percent of the world copper reserve is concentrated in Zambia, Zaire, South Africa, and Rhodesia Lead is found mainly in Morocco, Algeria, Tunisia, and South-West Africa (now Namibia) Tin is concentrated in Nigeria and Zaire, with zinc deposits scattered through Zaire, Nigeria, Zambia, South-West Africa, and along the Algerian-Moroccan border More than one quarter of the world bauxite reserve is in Africa, much of it in a belt stretching from Guinea to Togo, with another major deposit in Cameroon Zaire has about 90 percent of the world's known cobalt, and the largest-known reserve of titanium is in Sierra Leone Africa also has major deposits of antimony, beryllium, cadmium, and mercury Among the precious metals, Africa has more than half the known reserves of gold, South Africa, followed by Rhodesia, Zaire, and Ghana, are the major producers Platinum occurs in massive deposits in South-West Africa, tantalum and niobium in Zaire, zirconium in Nigeria, Senegal, Sierra Leone, South Africa, and the Nile delta, germanium in Zaire and South-West Africa, and lithium in Rhodesia The mines of South Africa and Zaire yield virtually the entire world supply of gem and industrial diamonds Phosphates are concentrated in N and W Africa, with major potash deposits in the People's Republic of the Congo and Ethiopia Other minerals found in Africa in exploitable quantities include clays, mica, sulfur, salt, natron, graphite, limestone, and gypsum

WATER A major problem of Africa is that of achieving effective control of water Huge areas suffer low rainfall and need water for irrigation Still larger areas receive only irregular rainfall and must store water as insurance against delayed or deficient rains On the other hand, some regions must cope with too much water great swamps exist, which could be drained to increase arable land, and vast areas suffer from periodic flooding Underground storage of water is difficult, and the water table is usually irregular

Because much of the rainfall in Africa is seasonal and many rivers flow only during the rainy season, there are shortages of surface water This has led to the use of groundwater, particularly in the desert and semidesert portions of the continent. In recent years, various dams and reservoirs have been constructed to channel water for irrigation and for hydroelectric power Major irrigation projects predominate in N Africa, Egypt, and the Sudan The Aswân High Dam (q v), astride the Nile, provides immense hydroelectric power and regulates the flow of water for the Nile delta Further S the Sennar Dam on the Blue Nile provides regular water supplies for the extensive irrigation projects of the Gezira area of the Sudan Below the Sahara, irrigation projects have been developed utilizing the Niger and Orange rivers

Much of the effort, however, has focused on tapping the energy potential of the river systems The numerous rivers of Africa and the abrupt descents of the waterways have led to estimates that the continent has some 40 percent of world hydroelectric potential Notable power projects include Owen Falls Dam on the Nile at Lake Victoria, Kariba Dam on the Zambezi between Zambia and Rhodesia, the complex of dams on the Congo and its tributaries, the Volta R project in Ghana, Cabora Bassa dam on the Zambezi in Mozambique, and Kainji Dam on the Niger R in Nigeria Various other

A camel market is in progress outside Barmou, an adobe-hut village of the Hausa tribe, in the Republic of Niger Marc & Evelyn Bernheim–Woodfin Camp & Associates



Dogon tribesmen in Mali perform a funeral dance As the elaborate headdresses suggest, the tribe is known for skill in carving Wendy Watriss-Woodfin Camp & Associates

hydroelectric projects were under construction in the mid-1970's These included a major complex on the Cunene R in S W Africa

Although most efforts to utilize African water resources have been national, several regional organizations have been created to further development of these resources Among the most prominent of these intergovernmental agencies are the Organization for the Development of the Senegal River, and the Niger River Commission

THE PEOPLE

The peoples of Africa are classified into five major groups, based on such characteristics as skin color, hair type, and physical stature The Bushmanoid peoples, thought to be among the earliest inhabitants of Africa, are now concentrated in S W Africa and in several isolated pockets in Tanzania The Bushmen and Hottentots are the sole surviving representatives of this group They have light yellowish-brown skin, which tends to be extremely wrinkled, short, black, so-called peppercorn hair, and a short stature The average height of an adult male Bushman is about 5 ft and that of a Hottentot male about 5 ft 3 in The women are noted for protruding buttocks (steatopygia) Pygmoid peoples are now found almost entirely in the rain forests of the Congo basin They have intermarried extensively with Negroid peoples, but those who have been least affected by contact are characterized by brownish skin, black, kinky hair, and height averaging about 4 ft 9 in in adult males The Negroid peoples of Africa are the most numerous and the most widely spread throughout the continent In physical characteristics they vary greatly In W and central Africa, skin color tends toward dark brown or black, in E and S Africa it is a lighter brown Negroid hair is most frequently black and kinky Stature varies from about 5 ft 8 in among the Mande of the western grasslands, to a shorter stature on the Guinea coast, to about 5 ft 10 in among the Nilotic peoples of E Africa The Caucasoid peoples of Africa inhabit the area above the Sahara, Ethiopia, and the E African Horn (modern Somalia) Related to Mediterranean Caucasoids, they are taller and somewhat more narrow-headed Their skin color ranges from very light brown to almost black, hair varies from wavy or occasionally straight to curly or kinky, stature ranges from about 5 ft 8 in among Galla to 5 ft 5 in among Berber peoples Mongoloid peoples are concentrated on the island of Madagascar The most recent group, these peoples are thought to be descendants of 5th- and 6th-century Indonesian settlers, they have yellowish-brown skin, straight black hair, and an average height of about 5 ft 2 in among adult males

In addition to racial classification, people can be grouped by cultural or ethnic differences More than 3000 distinct ethnic groups have been classified in Africa Most of the tribes or peoples find their origins in the extended family, which consists of several generations linked along either a male or female line, and their own nuclear families The family is usually led by a senior male Except among the Berbers and the Coptic Christians of Ethiopia, polygyny is the traditional ideal, although it is limited by the wealth or status of the husband Payment of a bride-price, by which the groom compensates the bride's parents for the loss of their daughter, is common throughout the continent In much of Africa the family is linked to a larger society through kin groups such as lineages and clans Kin groups generally tend to exclude marriage among their members, and members marry outside the group The village is frequently a single kin group united by either male or female descent

Demography. Although Africa covers about one fifth of the total world land surface, it has only one tenth the population In the mid-1970's the total population of the continent was estimated at about 365,000,000 Average density, some 36 people per sq mi , is considerably lower than the world average of 66 This reflects the fact that large areas, such as the Sahara and Kalahari, are virtually uninhabitable When the population living on arable or productive land is calculated, the average density increases to some 260 persons per sq mi Density varies greatly over the continent, with the most densely settled areas along the N and W coasts, along the Nile, Niger, Congo, and Senegal river basins, and in the E African plateau from the lakes to the Ethiopian Plateau Nigeria, with a population of 79,760,000, is the most populous nation in Africa

The African birthrate averages more than 46 per 1000 persons (By contrast, the birthrate in Europe is about 10 per 1000) The spread of medical services and better foods is primarily responsible for a sharp decrease in the death rate, which averages about 21 per 1000 Population growth, therefore, is slightly higher than 25 per 1000, and the age distribution is weighted heavily toward the young In most African countries, some 46 percent of the population is fifteen years of age or younger

The African population, despite the early growth of towns, has always been predominantly rural. About one fifth of the population lives in towns of more than 20,000 inhabitants Northern Africa is the most urbanized region, but major cities are located in every part of the continent Cairo, Alexandria, Casablanca, Kinshasa, Lagos, and Johannesburg all have populations of more than 1,000,000 Although these and other urban centers grow through natural increase, the towns act as magnets attracting large numbers of rural migrants who come either as permanent settlers or as short-term workers

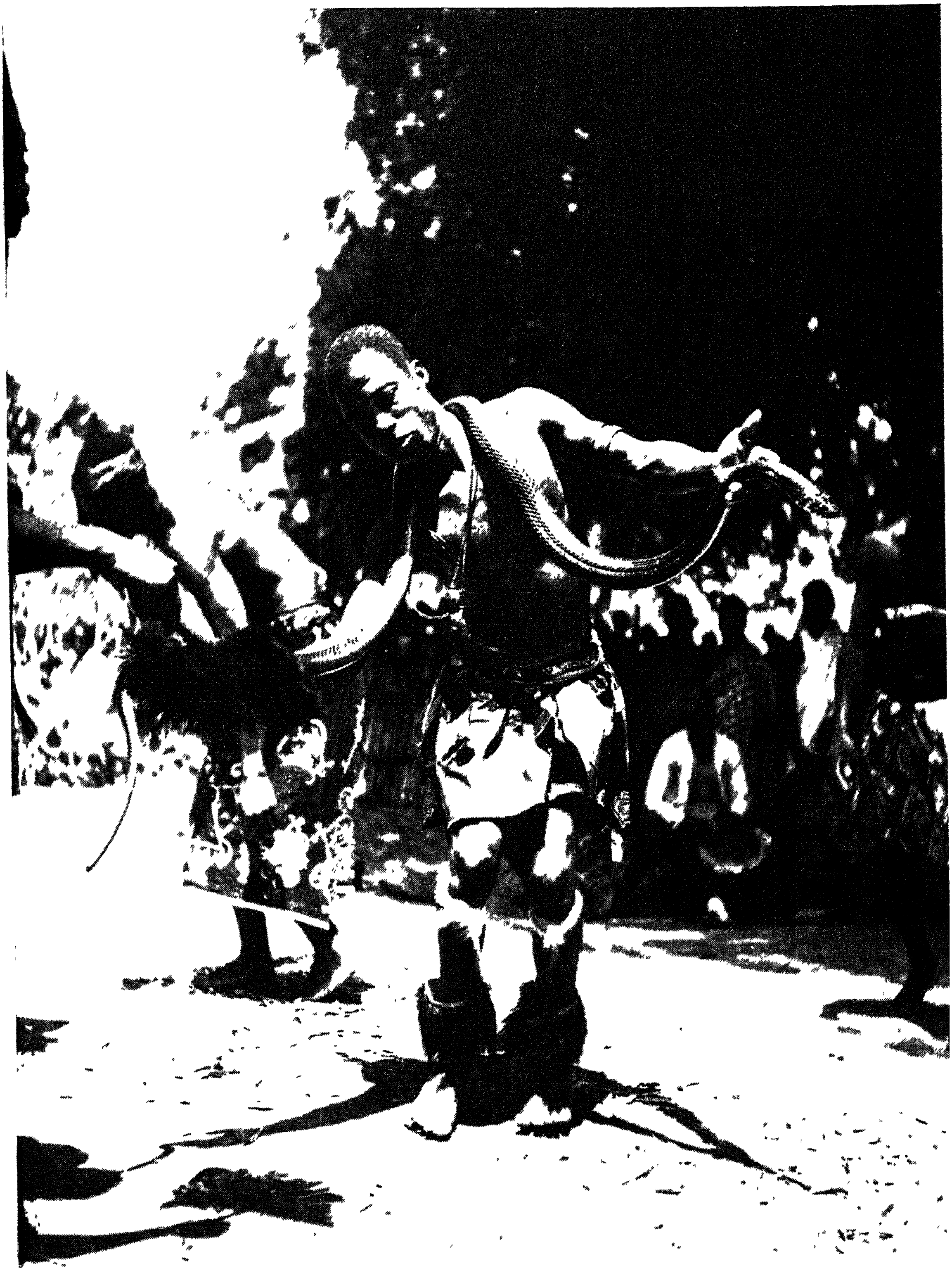
In addition to internal rural-to-urban migration, Africa has had significant international migrations In the days of the slave trade, an estimated 10,000,000 Africans were drawn into the Atlantic trade, and millions of others were seized for Asian markets In modern times, substantial labor migration developed, particularly of Africans from central Africa to the mines and factories of Zambia, Rhodesia, and South Africa, and of North Africans to France and, more recently, to the countries belonging to the European Economic Community (q.v) Wars, particularly in the Sudan, Rwanda, and Burundi, have led to massive refugee migrations, and the drought and famine of the early 1970's displaced hundreds of thousands from the affected areas below the Sahara

Few Europeans migrated to Africa except to the temperate areas along the N African coast, the E African highlands, and S Africa In these areas dominant white settler societies developed Asians, primarily from the Indian subcontinent, settled in E and S Africa, Lebanese and other Middle Eastern peoples established themselves in W and central Africa Both groups are primarily urban dwellers engaged in commerce or the professions The inflow of European and Asian peoples was the result of colonialism, and with the reestablishment of independent African states, white and Asian settler populations have declined

Language. *See* AFRICAN LANGUAGES, ARABIC LANGUAGE AND LITERATURE

Religion. The majority of African peoples practice indigenous or local religions Although these are of wide variety, they tend to have a single god or creator figure and a number of subordinate spirits—nature spirits who inhabit trees, water, animals, and other natural phenomena, and ancestral spirits such as founders of the family, lineage, or clan—who affect everyday life Contact with these spirits occurs generally through the intercession of a variety of ritual authorities, such as priests and family elders, who tend to work for good ends, and witches and sorcerers, who serve vengeful purposes. *See* RELIGION *Primitive Religions*

Islam, the second most widespread religion in Africa, was introduced throughout N Africa in the 7th century and in following centuries was spread by conquerors, traders, and nomadic Muslim groups along the E African coast and



In the Republic of the Ivory Coast, in western Africa, while members of his tribe look on in awe, a sorcerer dances with a poisonous black cobra in a ceremony to induce the forces of nature to provide abundant rain for his people's crops. By such public rites the elders pass on to the young traditional beliefs and attitudes that hold their culture together

Hassoldt Davis–Rapho-Guillumette

through the grasslands of w Africa In the 20th century, Islam has penetrated into the remaining portions of the continent The earliest of the Muslim schools of law, the Maliki, prevails over most of Muslim Africa except in Egypt, the Horn, and the E African coast

Christianity, the third most widespread religion, was introduced into N Africa in the 1st century and spread to the Sudan and Ethiopian regions in the 4th century Monophysite Christianity survived in Ethiopia through the Coptic Church, but in the other areas and in N Africa, Christianity was swept away by Islam It returned and spread through tropical Africa with the 15th-century rise of European overseas expansion. Today Protestant and Catholic groups are about equally represented throughout the continent

Small numbers of Jews are located in N and S Africa, and Hindu, Buddhist, and Taoist peoples are scattered through E and S Africa

Arising primarily from Christianity are certain nativistic religious movements, which tend to fuse orthodox Christian rites and beliefs with tribal religious elements Led by individual prophets, these separatist groups have spread throughout Africa, although they appear most widespread and powerful in S and central Africa

Art. *See* AFRICAN ART

Literature. *See* AFRICAN LITERATURE, ARABIC LANGUAGE AND LITERATURE

Music. *See* AFRICAN MUSIC, ARABIC MUSIC

ECONOMIC DEVELOPMENT

Traditionally, the vast majority of Africans have been farmers and herdsmen who raised foods and livestock for subsistence Few markets existed, and trade usually took place between relatives and friends Manufacturing and crafts were carried on as part-time activities A few states developed long-distance trade systems, and here complex exchange facilities as well as industrial specialization, communication networks, and elaborate governmental structures maintained the flow of commerce

With European colonization came taxes, which usually had to be paid in money, demand for certain agricultural and mineral products; labor migration, new and safe communication systems, and European techniques and crops Local industries and crafts—textiles and iron-making, for example—were undermined by cheaper or better European goods Processing industries developed, as did ports and administrative centers A variety of consumer industries sprang up to fill new consumer needs Depending upon investment funds, the need to process or produce items from local raw materials, availability of energy sources, and the size of local markets, African colonies and, later, nations were poised for more substantial economic development

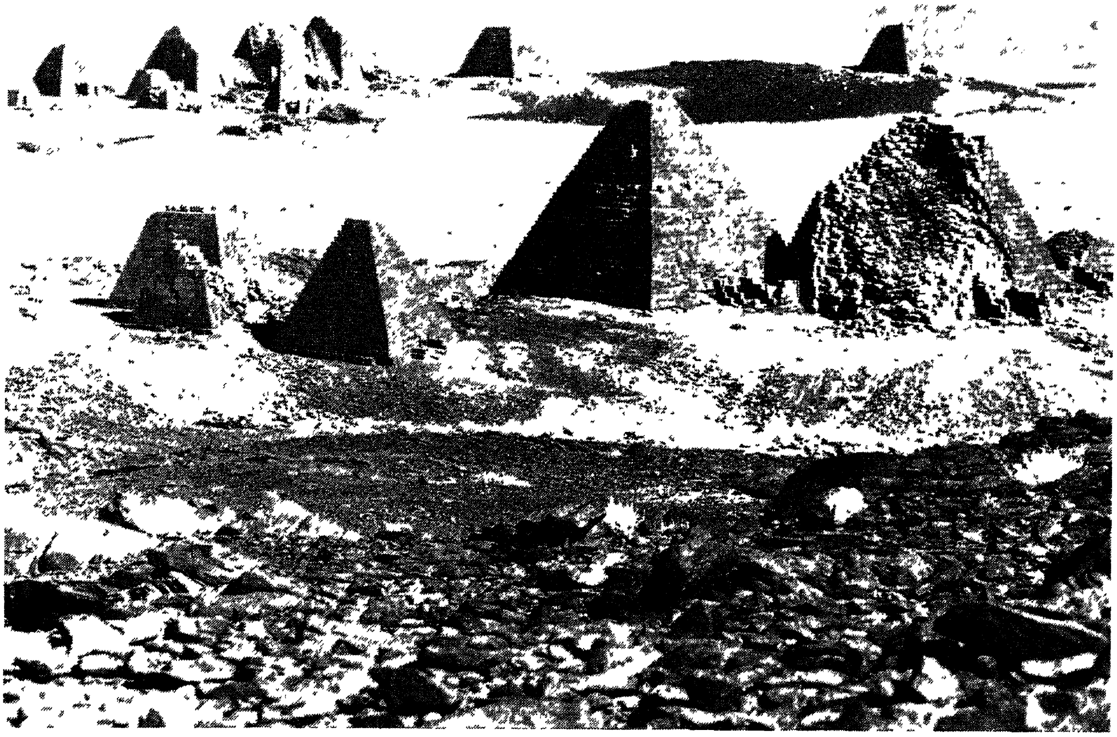
Despite the growth of commerce and industry, most Africans remain farmers and herdsmen In N and NW Africa, wheat, oats, corn, and barley are the important grain crops Dates, olives, and citrus fruits are the main tree crops, a variety of vegetables is grown Goats and sheep are the most significant livestock raised In the Sahara region, nomadic herdsmen raise camels, and a few farmers, situated in oases, grow dates and grains South of the Sahara, shifting agriculture, in which small areas were burned, cleared, and planted, then allowed to revert to bush, has given way to settled farming Grains are the main crops outside the rain forests, rice, yams, manioc, okra, plantains, and bananas are raised for food Outside tsetse fly areas and dense forests, cattle are raised in large numbers, but rarely for commercial purposes Dairy farming is limited

Commercial or cash-crop farming is common throughout Africa Foodstuffs are grown for local urban markets, but coffee, cotton, cocoa, peanuts, palm oil, and tobacco are grown by Africans for export European-owned plantations, found mainly in S Africa, concentrate on citrus, tobacco, and rubber

Logging is concentrated in rain-forest areas, where mahogany, ebony, and other furniture woods are found, and in temperate forests, where cork, cedar, and camphor bark are cut Inland fishing is concentrated in the rift-valley lakes and in scattered fish farms Ocean fishing is commercially important off Morocco and South Africa

Mineral extraction, including the production of oil, provides the bulk of export earnings, and extractive industries are the most developed sectors in most African economies

Stemming from mineral and petroleum extraction are processing industries, such as refining and smelting, which are located in most mineral-rich countries with adequate energy sources About 90 percent of manufacturing on the continent is carried on in South Africa. Heavy industry, such as metal-producing, machine-making, and transport-manufacturing, is concentrated in South Africa, although integrated iron and steel plants are now located in N Africa, Nigeria, and Rhodesia Large petrochemical complexes are located in South Africa, Rhodesia, and Egypt, and a number of different countries have refineries Throughout most of



At Meroe, in the Sudan, crumbling pyramids recall the vanished glories of the Cushite kings, who were buried inside them Marc & Evelyne Bernheim–Woodfin Camp

Africa, manufacturing is limited to making or assembling consumer goods, such as textiles, food and beverage preparation, shoes, building materials, and cement

The commercial sectors of most African states rely heavily on one or a few export commodities The bulk of trade occurs with industrialized nations, which require raw materials and sell industrial and consumer goods Trade between African states is limited by the competitive, rather than complementary, nature of their products, by communication systems, and by trade barriers, such as tariffs, and different currencies The major trade zones to have developed are the East African Community, the Economic Community of West Africa, and the Central African Economic and Customs Union

HISTORY

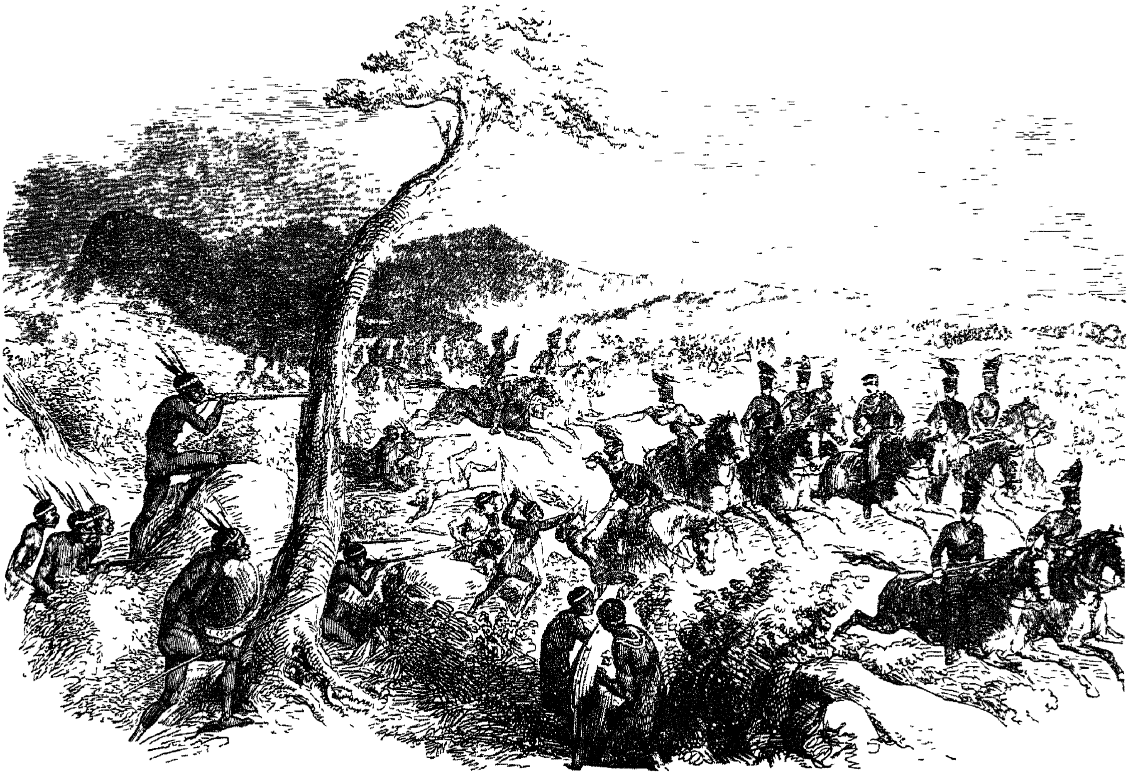
Some 5,000,000 years ago a type of man ape, regarded as a close evolutionary ancestor of man, inhabited southern and eastern Africa About 1,000,000 years ago this toolmaking hominid developed into the more advanced forms *Homo habilis* and *Homo erectus* The earliest true man in Africa, *Homo sapiens,* dates from about 130,000 years ago A hunter and gatherer, he banded together with others to form nomadic groups and was capable of making crude stone tools By approximately 35,000 years ago, man appears to have spread throughout Africa Distinct African races can be traced to about 10,000 years ago, by which time Bushmanoid sites could be found from the Sahara down to southern Africa Negroid peoples appear to have developed in western Africa during the same time

Settled communities appear to have been first developed in Africa in the Nile valley about 5000 B C Dependent upon agriculture, these communities benefited from the Nile's flooding as a source of irrigation and of new soils Elaborate political and religious systems emerged, and by 3000 B C the kingdoms that had been founded in both Upper and Lower Egypt were united into one state under the pharaohs During its period of prominence, Egyptian influence penetrated south into the Sudan, and when, after 1000 B C, the power of Egypt declined, Kush in the Sudan became the most important of the new African centers of power Iron-making was brought south from Egypt about 800 B C, and in following centuries it appears to have spread south and west through tropical Africa The last major Kushite state, Meroe, was supplanted during the 3rd century AD, and Aksum (Axum) became the major successor state During the same period Aksum, which evolved into Ethiopia, was converted to Monophysite Christianity Other Christian states—Alodio, Nukuria, and Nobatia—took hold in the Sudan and developed independently of Aksum

By the middle of the 1st century AD the various independent north African states, including Carthage (q v), had been conquered and absorbed into the Roman Empire Northern Africa became the granary of the empire, and under such Fathers of the Church as Saint Augustine, a stronghold and influential center of Christianity At the end of the 4th century the empire was divided into two parts All lands west of a line roughly bisecting modern Libya remained territories of the Western Empire, ruled by Rome, and all lands to the east became part of the Eastern or Byzantine Empire, ruled from Constantinople The Vandals, a Germanic tribe, crossed into northern Africa from Spain in the 5th century and conquered the western Roman provinces In the 6th century the Vandal kings were defeated by Byzantine forces, the provinces absorbed by the Eastern Empire

The Era of Empires and City-States. Islam gained a foothold in Africa within ten years of the death of Muhammad in 632 AD The weakened Byzantine province of Egypt was easily conquered, and during the period 660 to 670, Muslim raiders struck at the rest of Mediterranean northern Africa Although some raids reached the Fezzan area of southern Libya and parts of Morocco, Berber resistance proved too strong In the 8th century, however, Morocco was conquered and the Christian Berbers of the coast began to be converted The pagan Berbers of the mountainous interior resisted and either maintained isolated strongholds or withdrew into the Sahara Along the coast the Arab conquerors remained a small ruling minority for several centuries Only in the mid-11th century, with the arrival of new Arab immigrants, the nomadic Banu Hilal, were the pastoral Berbers fully assimilated into Muslim religious and cultural life The remaining resisters were driven into the deserts of Mauritania

A black king and his wife (left) receive Dutch traders in this engraving from Théodore de Bry's Petits Voyages *(1599)* New York Public Library Picture Collection



British troops and the Bantu people clash in 1851 in the eastern frontier region of Cape Colony, South Africa

New York Public Library Picture Collection

A number of rival dynasties emerged on the north African coast, and from the 10th century onward, north African Muslims engaged in raids and expeditions of conquest against Christian Europe During the Crusades, Egypt, Tunis, and other north African areas were invaded, but by the late 13th century, invasion attempts had given way to raiding and pirating by both sides In 1517 Ottoman Turks invaded Egypt and within fifty years had established nominal control of the north African coast, *see* OTTOMAN EMPIRE

The initial 7th-century Muslim invasion of Egypt had quickly led to attacks upon the Christian states of the Sudan and Ethiopia The armies of Nobatia proved strong enough, however, to force the conclusion of a treaty that brought comparative peace for 600 years During the 14th century Christian Sudan fell to the armies of Mameluke Egypt (*see* MAMELUKES), and with the coming of Arab immigrants, the region became thoroughly Arabicized The Ethiopians were able to keep Muslim invaders at bay somewhat longer, but in the middle of the 16th century, the armies of the sultanate of Adal, with Turkish support, overran some three quarters of the country

See separate *History* sections on most of the countries mentioned

WEST AFRICAN KINGDOMS A number of kingdoms emerged in the western Sudan whose economic base lay in their control of trans-Saharan trade routes Gold, kola nuts, and slaves were sent north in exchange for cloth, utensils, and salt Ghana, the earliest known of these states, came into being by the 5th century A D in what is now southeastern Mauritania (Its capital, Kumbi Salih, has been excavated in modern times) By the 11th century Ghanaian armies, equipped with iron weapons, had made it master of the trade routes extending from modern-day Morocco in the north to the coastal forests of western Africa in the south Nomadic Berber tribes, particularly the Sanhaja confederation, formed the chief link between Ghana and the north Once Muslim Arabs gained control of the northwestern coasts, they began to exploit these Berber routes By the early 11th century Muslim ministers and advisers were at the court of Ghana, and Muslim merchants lived in large foreign quarters from which they conducted lucrative large-scale trade Late in the 11th century, Ghana was destroyed by the Almoravids (*see* ALMORAVIDS), a militant Muslim movement founded among the Berber tribes of the

Sanhaja In the early 11th century they raised a *jihad* (holy war) and soon came to control the caravan routes of the Sahara The movement then split, with one part pushing north to conquer Morocco and Spain, while the other moved south to raze (about 1076–77) the capital of Ghana During the following century the Susu, formerly vassals of Ghana, gained control of the area, but in turn they were conquered by the people of Mali about 1240

Mali, centered on the upper reaches of the Senegal and Niger rivers, evolved from a group of Mande chieftaincies, probably by the early 11th century In the middle of the 13th century, the state began a period of expansion under the vigorous ruler Sundiata Soon afterward the rulers of Mali appear to have converted to Islam The high point of the Mali empire was reached under Mansa Musa, who conducted a pilgrimage to Mecca in 1324–25, opened diplomatic relations with Tunis and Egypt, and brought a number of Muslim scholars and artisans to the empire, from the time of Mansa Musa onward, Mali appeared on the maps of Europe After 1400 the empire declined through dynastic disputes, and Songhai (q v) emerged as the leading state in the western Sudan Although Songhai dates from before the 9th century, it enjoyed its greatest period of expansion under Sonni Ali (r 1464–92) and Askia Muhammad (r 1493–1528) During this time Islam flourished at the court, and Timbuktu became a major center of Muslim learning, renowned for its university and its book trade Attracted by its wealth, the armies of al-Mansur (r 1579–1603) of Morocco overran the Songhai capital of Gao in 1591 (*see* MOROCCO *History)* Following the collapse of Songhai, a number of small kingdoms, Macina, Gonja, Segou, and Ka'arta, strove to dominate the western Sudan, but continual strife and economic decline were the only results

To the east of Songhai, between the Niger R and Lake Chad, the Hausa city-states and the Kanem-Bornu empire emerged The Hausa states (Biram, Daura, Katsina, Zaria, Kano, Rano, and Gobir) originated before the 10th century, and after the fall of Songhai the trans-Saharan trade moved eastward, where it came under the control of Katsina and Kano These became centers of flourishing commerce and urban life Islam appears to have been introduced into the Hausa states in the 14th century from Kanem-Bornu

The latter empire is known to have existed in the 8th century as a loosely knit state north and east of Lake Chad It was first ruled by a nomadic people, the Zaghawa, but they were replaced by a new dynasty, the Saifawa, who ruled from about 800 to 1846 The new rulers were converted to Islam about the 11th century In the late 14th century they moved into the Bornu region, and the older Kanem area fell to the Bulala people The most well known of the Bornu rulers was Mai Idris Alooma (r 1570–1602), who introduced firearms purchased from the Ottoman Turks During the height of its power, Bornu-Kanem controlled the eastern Saharan routes to Egypt, but by the middle of the 17th century it had gone into a slow decline.

During the period of the great Sudanic empires, the lives of the masses of farmers and fishermen remained virtually unchanged Imported goods or luxuries were consumed only by the ruling classes, while the farmers lived in subsistence economies, subject to periodic tax gathering and occasional slave raids Islam was associated with the great urban centers and was the religion of some of the ruling classes and of the foreign residents By the late 15th century, however, the nomadic Kunta Arabs began to preach, and during the mid-16th century the Qadiriyya brotherhood began to spread Islam throughout the western Sudan At about the same time, the Fula (q v), a nomadic pastoral people, were wandering slowly eastward from the Futa Toro region in Senegal, gaining converts for Islam During this period, Islam became a personal religion rather than merely a religion of state Indeed, Islam appears to have declined among the ruling classes, and non-Muslim dynasties began to rule in old Islamic strongholds This continued until the 18th century, when Islamic reform and revival movements sprang up among the Fula, Mandingo, Susu, and Tukolor

Old dynasties were overthrown, and theocratic states were founded which spread Islam to new areas In the Hausa states, Shehu Usman dan Fodio, a Muslim teacher, led a revolt among the Fula, who between 1804 and 1810 overthrew the pagan Hausa rulers and established new dynasties An attempt to sweep into Bornu was successfully resisted by the ruler Mai Al-Kanemi The new Fula empire was initially divided between the shehu's brother and his son, but after 1817 the son and his successors were the sole overlords They were unable, however, to maintain more than a shadow hegemony over the semiautonomous emirates

Another theocratic state was formed in Masina in 1818 by Seku Ahmadu, a Fula Muslim During his rule an empire embracing the whole of the Niger R region from Jenne to Timbuktu was created Upon his death in 1844 his son took power, but in 1862 the empire fell to another Muslim reformer, Al-hajj Umar, who created a vast empire in the Senegambia region.

EAST AFRICAN KINGDOMS The first records of east African history appear in the *Periplus of the Erythræan Sea* (100? A.D.), which described the commercial life of the region, its ties to the Greco-Roman world, and its trade with Arabia, Persia, and India. Indonesian immigrants reached Madagascar sometime during the 1st millennium A.D., bringing new foodstuffs, notably bananas, which then spread throughout the continent. As Bantu-speaking and Nilotic peoples occupied the interior, absorbing the earlier Bushman peoples, Arab settlers colonized the coast and established trading towns. Ivory, gold, and slaves were the main exports. By the 13th century a number of significant city-states had been established, among them Mogadishu, Lamu, Mombasa, Kilwa, and Pate. An urban Arab-Swahili culture developed through mutual assimilation of Bantu and Arabic speakers. The ruling classes appear to have been of a mixed Arab-African ancestry, the masses were Africans, many of them slaves. The way of life in the towns was clearly mercantile. These city-states were oriented toward the sea, and their impact upon inland peoples was virtually nonexistent until the 19th century.

Inland from the coast, the Interlacustrine states began to be formed by about the middle of the 14th century. Little is known of their early history, but one widely held theory is that western Kushite peoples may have migrated from the Ethiopian highlands to found these kingdoms. The Kushites are associated with the ancestors of the Hima and Tusi peoples and with the Bachwezi. A variety of Bachwezi kingdoms are thought to have been established between lakes Victoria and Edward between 1350 and 1500. These were supplanted by an early wave of Lwo peoples, who moved south from the Sudan about 1500. The new immigrants adopted local Bantu languages in Bunyoro country, but in Acholiland, Alurland, and in the Lango country they retained their own separate language. With the coming of the Lwo, new states were founded, among them Bunyoro, Ankole, Buganda, and Karagwe. Of these states, Bunyoro was the most powerful until the middle of the 17th century. Then Buganda began to expand, and its armies raided throughout wide areas. An elaborate centralized bureaucracy was founded, with most district and subdistrict chiefs appointed by the *kabaka* (king).

Further to the south, in Rwanda, a cattle-raising, pastoral aristocracy founded by the Bachwezi (alternatively called Batutsi or Bahima in this area) ruled over settled Bantu peoples from about the 16th century onward.

CENTRAL AFRICAN KINGDOMS Even less is known of the states formed in central Africa. In the Congo savanna, south of the tropical rain forests, Bantu-speaking peoples are thought to have established agricultural communities by the beginning of the 9th century. In some places, long-distance trade to the east coast developed, with copper and ivory among the main exports. Probably during the 14th century the Kongo kingdom was established, dominating an area from the Congo R. to Stanley Pool, and from the Loje R. to the Atlantic. An elaborate political system developed, with provincial governors and a king elected from among the descendants of the founding king, Wene. In the area between the upper Kasai and Lake Tanganyika, the various small chiefdoms were organized, about 1500, into the Luba Empire. Its founding figure, Kongolo, subdued several small villages in one area and then used this as a base for wider conquest. No adequate centralizing mechanisms were developed, however, so dynastic struggles and breakaway states were a continual problem. Around 1600 one of the younger sons of the dynasty left the kingdom and founded the Lunda Empire. The Lunda state itself soon split, with members of the royal dynasty leaving to found such new states as the Bemba kingdom, Kasanje, and Kazembe. The latter became the largest and most powerful of the Luba-Lunda states, and between 1750 and 1850 it dominated southern Katanga and parts of the Rhodesian plateau.

Bantu-speaking peoples moving east from the Congo region during the 1st millennium A.D. are thought to have assimilated local Stone Age Rhodesian peoples to form the Shona culture. These people, in turn, may have been responsible for Zimbabwe, a cluster of stone structures, the original purpose of which remains unclear, and the Mutapa Empire. Based upon long-distance trade in gold, Mutapa is thought to have stretched, at its height in the 15th century, from the Zambezi R. to the Kalahari to the Indian Ocean and to the Limpopo R.

SOUTHERN AFRICAN KINGDOMS Before the 19th century, Bantu-speaking peoples had pushed aside or assimilated their Bushman and Hottentot predecessors in southern Africa and had established a number of sedentary states. Population pressures and tribal rivalries resulted in a series of wars (the *mfecane*) that led to large-scale migrations through south and central Africa. About 1816 the Zulu chief Chaka (1773–

1828) developed new military techniques and embarked upon wars of conquest against neighboring peoples. The tribes defeated by the Zulu armies migrated away from the southeast portion of South Africa, remodeling their own fighting techniques on those of the Zulu, they overwhelmed more distant peoples, who, in turn, were forced to seek new homes. The Ndwandwe, led by their chief Sobhuza, moved north and established the Swazi kingdom about 1840. The Ngoni also moved north, pushing through Mozambique and beyond Lake Malawi, where, about 1848, they split into five kingdoms, which raided extensively between Lake Victoria and the Zambezi. Another group, led by Soshangana, migrated into south Mozambique, where they founded the Gaza state about 1830. The Kololo migrated north into Barotseland and began a struggle for domination with the local Lozi people. The Ndebele moved (1824–34) west and then north (1837) into Rhodesia, founding a kingdom there in Matabeleland.

The Era of European Colonialism. The first sustained European interest in Africa developed through the efforts of Henry (q.v.), Prince of Portugal, usually known as Henry the Navigator. Numerous expeditions were sent out after 1434, each seemingly extending European knowledge of the African coastline southward, until, in 1498, Vasco da Gama (q.v.) rounded the Cape of Good Hope and reached India.

The Portuguese explorations were motivated by a variety of impulses: a desire for knowledge, a wish to bring Christianity to pagan peoples, the search for potential allies against Muslim threats, and the hope of finding new and lucrative trade routes and sources of wealth. Wherever the Portuguese and the English, French, and Dutch who followed them touched, they disrupted ongoing patterns of trade and political life and changed economic and religious systems.

The Portuguese established a chain of trading settlements along the west African coast. El Mina, founded on the Gold Coast in 1482, was the most important. African gold, ivory, foodstuffs, and slaves were exchanged for ironware, firearms, textiles, and foodstuffs. The lucrative Portuguese trade attracted rival European traders who, in the 16th century, created competing stations or attempted to capture existing trade forts. In western Africa the new trade had profound effects. Earlier trade routes had been oriented northward across the Sahara, primarily to the Muslim world. Now the routes were reoriented to the coast, and as the states of the savanna declined in economic importance, states along the coast increased their wealth and power. Struggles soon developed among coastal peoples for control over trade routes and for access to the new firearms introduced from Europe.

With the rise of the slave trade to the Americas, wars over the control of African commerce became more intense. During the four centuries of the slave trade, between 30,000,000 and 100,000,000 Africans were estimated to have fallen victim to this traffic in human lives. Most of these were captured by other Africans and exchanged for a variety of consumer goods. The first major slaving kingdom, established in the 15th century, was Benin, in modern west Nigeria. By the end of the 17th century, it had been supplanted by the kingdoms of Dahomey and Oyo. In the mid-18th century the Ashanti began their rise as a major west African power. Under *asantehene* (king) Osei Kojo, Ashanti armies began to push south toward European trading stations located along the Gold Coast. Although they failed in their efforts to clear the routes of middlemen, they secured steady supplies of firearms, which were used to expand northward and to contest their eastern frontiers with Dahomey. Further east the Yoruba kingdom of Oyo declined in the late 18th century, bringing civil war and the intervention of Fula forces from the north. About 1835 the imperial capital, Old Oyo, was abandoned, but in the Battle of Oshogbo (about 1840) the Fula were driven back. Continued civil war brought intervention from Dahomey and hastened the collapse of Yoruba power.

During the second half of the 18th century, sentiment in Europe turned against the slave trade. Following the Mansfield decision of 1772, which freed slaves held in Great Britain, plans were made for a west African colony for freedmen. This was originally attempted (1787–90) in the "Provence of Freedom" at Saint George's Bay; after it failed, a second attempt was made by abolitionists, who, in 1792, founded Freetown. When the British outlawed the slave trade for British citizens in 1807, Freetown appeared a desirable naval base, and in 1808, Sierra Leone was made a crown colony. The example of Sierra Leone appealed to Americans interested in black colonization, and in early 1822 the American Colonization Society succeeded in establishing its colony, Liberia, at nearby Cape Mesurado.

The British desire to suppress the slave trade found expression in attempts at redirecting African commerce toward other exports, such as palm oil, heightened missionary activity, and the imposition of British government jurisdiction over properties previously held by British merchants Such developments frequently involved Great Britain inadvertently in struggles with African states and led to its assumption of sovereignty over certain African territory On the Gold Coast the British government, in 1821, took control of a series of forts Through misunderstandings the first of a series of Ashanti-British wars occurred from 1823 to 1826, these conflicts were to continue intermittently until the end of the century Although the government gave up control of the forts in 1828, it again assumed jurisdiction in 1843 British attempts to protect coastal Africans from the Ashanti led to more fighting In the Niger delta area of Nigeria, the British abolition of slavery brought about concrete efforts to restrain the illegal trade, but in pursuit of this end Great Britain required a nearby port In 1852 the ruler of Lagos accepted British protection, and in 1861 Lagos was annexed as a crown colony

In central and east Africa the European impact differed When the Portuguese arrived on the Congo-Angola coast in the 1480's, they quickly allied themselves with the rulers of the Kongo, who became converted to Christianity and attempted to create a westernized state This aim was frustrated, however, by fraternal wars and by Portuguese introduction of the slave trade The region was soon immersed in strife, and during the 16th century the kingdom collapsed Further south the Portuguese founded Luanda in 1575 as a base for their penetration of the Angolan hinterland When they reached the east African coast, they attempted to cut off the area's trade with the Muslim world In the process a number of the city-states were destroyed, others were occupied, and the entire area went into economic decline After the Portuguese were finally expelled from Mombasa in 1698, the coast reverted to local rule, but during the 18th century the rulers of Oman (q v) established at least nominal control In the early 19th century, Sayyid Said (r 1806–56), ruler of Oman, transferred his capital to Zanzibar, which then served as a base to strengthen his control of the coast and to penetrate inland for trade with the Interlacustrine states British efforts to control the east African slave trade led, in 1822, to a treaty prohibiting the sale of slaves to subjects of Christian countries An active slave trade continued, however, with large numbers of Africans seized for the clove plantations of Zanzibar and for Middle Eastern slave markets

In Ethiopia the arrival of the Portuguese had helped stave off conquest by the Muslims In 1543 a combined Portuguese-Ethiopian force crushed a Muslim army, and the Ethiopians regained much of their lost territory After doctrinal disputes between Coptic churchmen and Portuguese Jesuits, the Portuguese were expelled in 1632 Ethiopia went into a period of isolation, and by the 18th century the monarchy was in collapse From about 1769 to 1855, Ethiopia endured the "age of princes", during which the emperors were puppet rulers controlled by powerful provincial nobles The era came to an end with the crowning of Emperor Theodore II, a minor chief who rose to the throne by defeating his rivals

Although the Portuguese largely ignored southern Africa, their rivals the Dutch, beginning in 1682, developed the area as a way station to the East Indies Colonists were encouraged to settle around Cape Town, and soon a new culture and people, the Boers or Afrikaners, began to develop Despite government resistance they began to move inland in search of better land and, after 1815, to escape control by the British government As they trekked inland they encountered the Zulu and other Bantu peoples expanding southward The result was a series of wars for land During the course of their migrations, the Boers were among the first whites to explore the African interior

In the late 18th century, however, scientific interest and the search for new markets began to stimulate an age of exploration The British explorer James Bruce (q v) reached the source of the Blue Nile R in 1770, his countryman Mungo Park (q v) journeyed (1795–1805) to discover the course of the Niger R , the German explorer Heinrich Barth made extensive explorations of the Muslim western Sudan, the Scottish missionary David Livingstone (q v) made a number of significant explorations and in 1855 named Victoria Falls, the British explorers John Hanning Speke (q v.) and James Augustus Grant (1821–93), traveling downstream, and Sir Samuel White Baker (q v), working upstream, solved the mystery of the source of the Nile R in 1863 Following the footsteps of the explorers (and sometimes preceding them) were Christian missionaries and then European merchants

As European private interests in Africa grew, the involvement of their governments multiplied The French began the conquest of Algeria in the 1830's, but the systematic occupation of tropical Africa did not occur until the second half of the century As European citizens and administrators penetrated inland, they encountered resistance from dominant peoples and

In 1974, in the capital, Bissau, tens of thousands joyfully celebrate the independence of a new nation, Guinea-Bissau, in western Africa Dejean-Sygma

welcome from subordinated peoples seeking allies or protectors. From about 1875 to the beginning of World War I, most of Africa was partitioned among Belgium, France, Germany, Great Britain, Italy, and Portugal. In 1876 King Leopold II of Belgium (*see under* LEOPOLD) convened a conference to determine the best methods of exploring Africa. The claims of his International African Association for privileged position were brushed aside, however, and it was confined to exploring and colonizing portions of the Congo region. By 1884 the intense rivalry of the European powers for additional African territory, and the ill-defined boundaries of their various holdings, threatened their international relations. With Leopold taking the initiative, a conference was called at Berlin. All the nations of Europe, together with the United States, sent delegates to the conference (1884–85), at which the modern partition of Africa took shape.

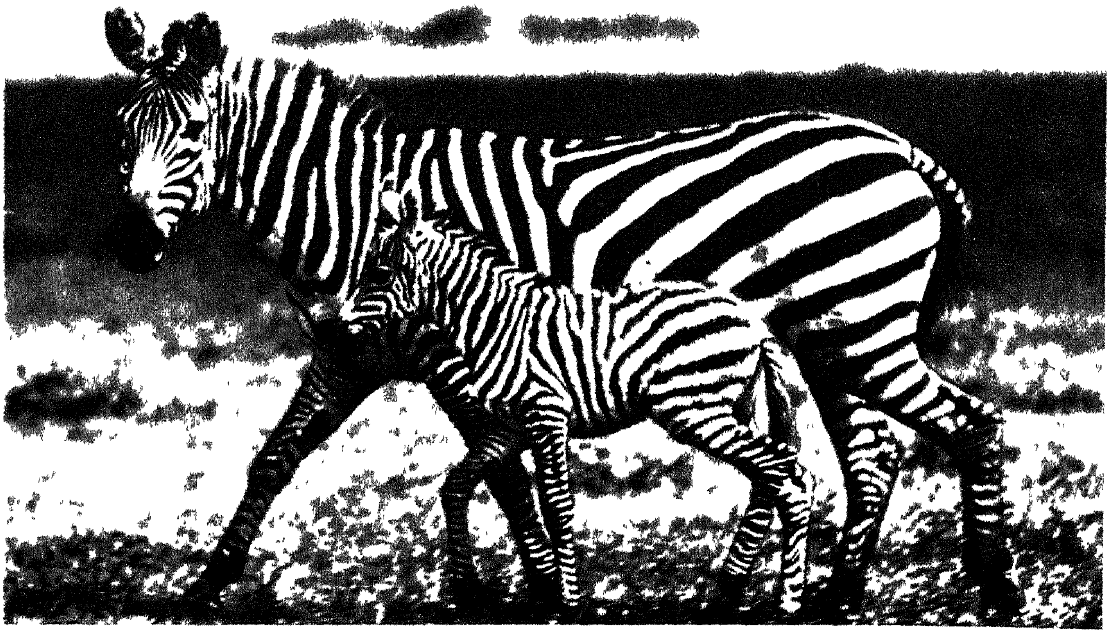
At the Berlin conference the powers defined their spheres of influence and laid down rules for future occupation on the coasts of Africa and for navigation of the Congo and Niger rivers. Among the important provisions of the General Act of Berlin was the rule that when a power acquired new territory in Africa or assumed a protectorate over any part of the continent, it must notify the other powers signatory to the conference. During the next fifteen years, numerous treaties were negotiated among the European nations, implementing and modifying the provisions of the conference. Two such treaties were concluded in 1890 by Great Britain. The first, with Germany, demarcated the spheres of influence of the two powers in Africa. The second treaty, with France, recognized British interests in the region between Lake Chad and the Niger R. and acknowledged French influence in the Sahara. Other agreements, notably those between Great Britain and Italy in 1891, between France and Germany in 1894, and between Great Britain and France in 1899, further clarified the boundaries of the various European holdings in Africa.

No African states had been invited to the conferences, and none were signatory to these agreements. Whenever possible the decisions made in Europe were resisted when applied on African soil. The French faced (1870) a revolt in Algeria and resistance (1881–1905) to their efforts to control the Sahara. In the western Sudan, Samory Touré and the son of Al-Hajj Umar attempted (1873–98), unsuccessfully, to maintain their independence. Dahomey was occupied by French forces in 1892, and the Darfar-Wadai region was the last area to fall to

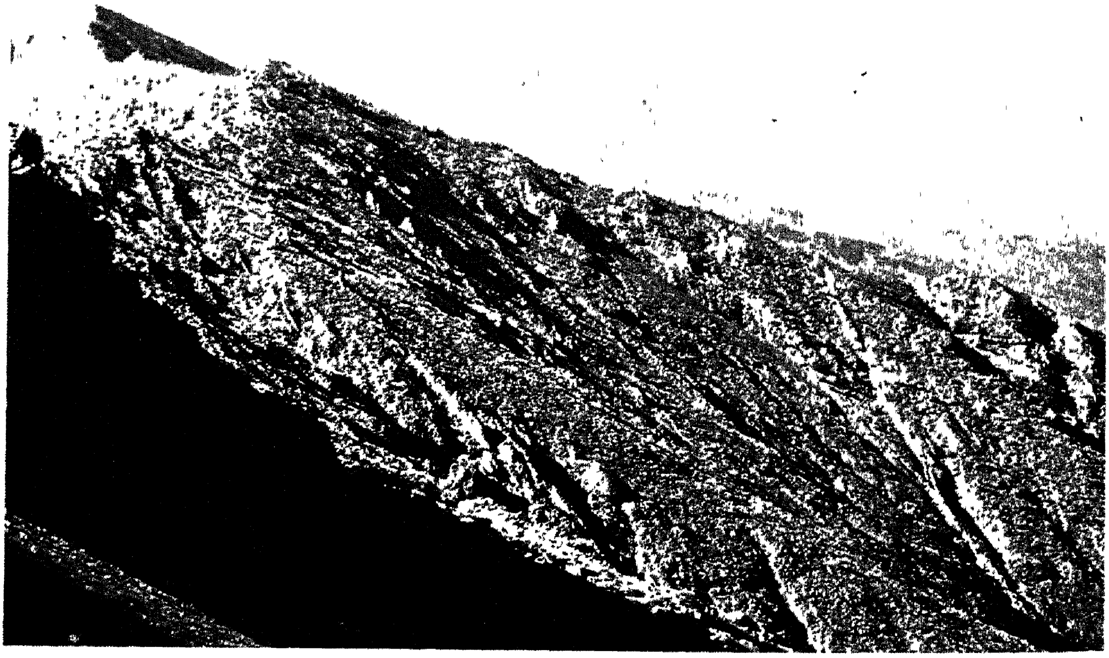
Lumbermen (above, left) prepare to replace a band-saw blade at a sawmill in Ibadan, Nigeria University College in the same city offers courses that qualify graduates to work with the Nigerian Forestry Service A Sudanese mother carrying her baby (above, right) works in the cotton fields of the Gezira region of the Sudan Cotton is the chief Sudanese crop and most of it is grown in the Gezira region United Nations

Africa. Plate 1.

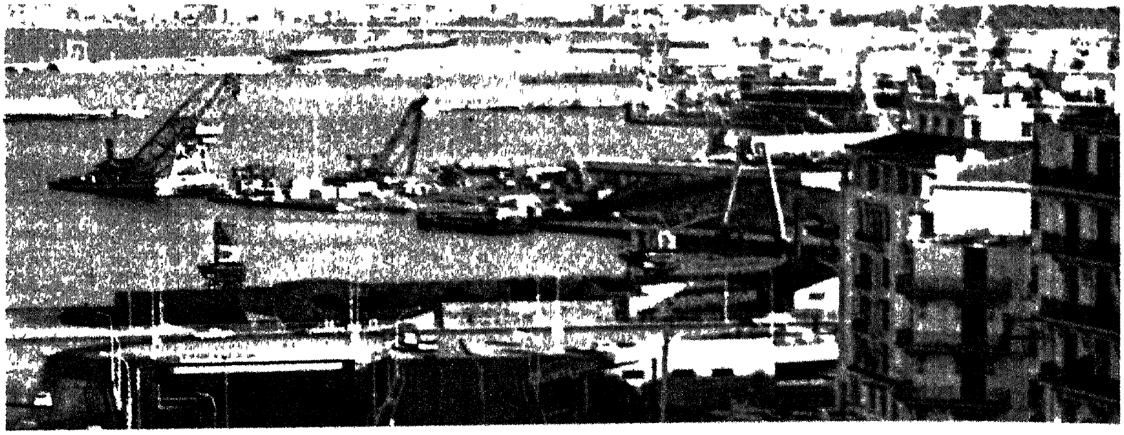
Families receive medical attention at an open-air clinic in a coastal district of Tanzania Mobile medical teams regularly visit isolated communities United Nations



Africa, Plate 2. *Zebras are among the numerous animals indigenous to the continent To ensure the preservation of their fauna, many African countries have established game reserves Tenerife (below) is the largest of the Canary Islands Pico de Teide, a 12,172-ft peak on the island, is one of Africa's most compelling sights*



Africa. Plate 3. *Senegalese fishermen (above) return after a day at sea. Fish canning is an important industry. Liberian women (below) shop for housewares in a public market in their capital, Monrovia.* United Nations



United Nations

United Nations

Africa. Plate 4. Top. Algiers' modern harbor facilities make the capital of Algeria a flourishing shipping point and a major Mediterranean refueling station. Center: A sale is transacted at an Algerian carpet market. Bottom: Angora goats graze in Orange Free State, a province of the Republic of South Africa.

South African Tourist Corp

the French, in 1900. British administrators encountered similar resistance from the Boers in South Africa during the periods 1880-81 and 1899-1902. British and Boer settlers had to conquer Matabeleland (q.v.) in 1893, and three years later both the Matabele (Ndebele) and their subordinates, the Shona, revolted. Revolts broke out in Ashantiland in 1893-94, 1895-96, and 1900, and in Sierra Leone protectorate in 1897. The British conquest of the Fula-Hausa states was resisted (1901-03). Sokoto revolted in 1906. The Germans faced (1904-08) the Herero insurrection in South-West Africa and the Maji Maji revolt (1905-07) in Tanganyika. Only the Ethiopians under Emperor Menelik II (r. 1889-1911) were successful in resisting European conquest, having, in 1896, annihilated an Italian force at the Battle of Adwa (Aduwa).

Once the colonies were conquered and pacified, the colonial administrations began to develop transportation systems so that raw materials could be shipped more easily to ports for export, and to institute tax systems that would force subsistence farmers either to raise cash crops or to engage in migrant labor. Both policies were well under way when World War I disrupted these efforts. During the course of the war, the German colonies were conquered and later were mandated by the League of Nations to the various Allied powers. Thousands of Africans either fought in the war or served as porters for the Allied armies. Resistance to the war was limited to the short-lived 1915 rebellion of John Chilembwe, an African clergyman, in Nyasaland (now Malawi).

After World War I, efforts for the exploitation of the colonies were tempered, and greater attention was paid to providing education, health services, and development assistance, and to safeguarding African land rights. Nevertheless, the white settler colonies, such as Algeria, Southern Rhodesia, and Kenya, were given considerable internal self-government. Southern Rhodesia was made an internally self-governing crown colony in 1923 with virtually no provision for African voting. During the interwar years, various types of African-organized protest and nationalist movements began to emerge. Yet, on the whole, membership was limited to western-educated African groups. Mass parties developed only in Egypt and Algeria, where large numbers of Africans had abandoned their traditional way of life and were developing new identities and allegiances. Ethiopia, which had earlier successfully resisted European colonization, fell to an Italian invasion in 1936 and did not regain its independence until World War II. With the coming of the war, Africans served in the Allied armies in even greater numbers than before, and the colonies generally supported the Allied cause. Fighting on the continent, which was limited to north and northeast Africa, ended in May, 1943.

The New Africa. Following the war, the European colonial powers were physically and psychologically weakened, and the balance of international power shifted to the U.S. and the Soviet Union, both professed anticolonial nations. In north Africa, French rule was opposed from 1947 onward with sporadic terrorism and rioting. The Algerian revolution began in 1954 and continued until independence in 1962, six years after Morocco and Tunisia had received independence. In French sub-Saharan Africa, an effort had been made to stave off nationalist movements by granting the inhabitants of the overseas territories full status as citizens and by allowing deputies and senators from each territory to sit in the French National Assembly. Nonetheless, the qualified franchise and communal representation given to each territory proved unacceptable. In the British areas the pace of change also quickened after the war. Mass parties, enrolling as wide a range of social, ethnic, and economic groups as possible, began to appear. In Sudan, disagreements between Egypt and Great Britain over the direction of Sudanese self-government led the British to accelerate the pace, and in 1954 Sudan achieved independence. During the 1950's, the examples of newly independent nations on other continents, the activities of the Mau Mau terrorist movement of Kenya, and the effectiveness of such popular African leaders as Kwame Nkrumah further quickened the pace. The independence of Ghana in 1957 and Guinea in 1958 set off a chain reaction of nationalist demands. In 1960 alone seventeen sovereign African nations came into being.

By mid-1978 almost all of Africa was independent. The Portuguese possessions—Angola, Cape Verde, Guinea-Bissau, and Mozambique—became independent in 1974-75. France relinquished the Comoro Islands in 1975, and the French Territory of the Afars and the Issas gained independence as Djibouti in 1977. In 1976 Spain yielded Spanish Sahara, which then was divided between Mauritania and Morocco. The only remaining large dependencies were South-West Africa and Rhodesia (whose white minority had declared unilateral independence in 1965), scheduled for early independence.

The new African states face a variety of major problems. One of the most important is the creation of a nation-state. Most African countries retained the same frontiers arbitrarily drawn by the late 19th-century European diplomats and administrators. Ethnic groups may be divided by national boundaries, but often loyalties are stronger toward such groups than toward the state. Part of the solution to this problem could stem from efficient governmental administrations that, by their actions, would receive the support and loyalty of the entire population. When the African states attained independence, however, the dominant nationalist movements and their leaders installed themselves in virtually permanent power. They called for national unity and urged that multiparty parliamentary systems be discarded in favor of the single-party state. When these governments proved unable or unwilling to fulfill popular expectations, there was often no alternative except military intervention. Projecting the role of efficient and honest public guardian, military governments have emerged as a major African political form. Under such a system, day-to-day administration is left to the permanent civil service. In the 1970's, however, the military governments of some countries appeared to be developing the same vested interest in power that had characterized their predecessor civilian governments. Economic development was the third major problem. Although a number of African states have considerable natural resources, few have adequate financial resources to develop their economies. Foreign private enterprise has often regarded investment in such underdeveloped areas as too risky, and this view has been justified in a number of instances. The major alternative source of financing is the national or multinational source. Yet foreign aid has tended to decrease as the U.S.-Soviet Union détente takes hold, and the former colonial powers have tended to need such funds for their own economic modernization. Expectations for a better living standard have increased, and the price of consumer and other manufactured goods has kept pace, but the price of most African primary products has lagged behind. This has resulted in serious foreign-exchange problems, national debts, and public discontent. A fourth major problem has been the inability to project a voice in international affairs. Most African states regard themselves as part of the Third or Nonaligned World, which is seen as a force for moral leadership in the international community. Because of their lack of military or financial power, however, the views of African nations rarely appear to be counted.

AFRICAN ART, in general usage, works of art, consisting largely of sculpture (masks, figures, and architectural elements), of the principal tribes of West Africa and the Congo area.

The traditional African tribal artist has always been part of the mainstream of his society. Economically he is part of the farming community, morally he affirms the values of his society. As a participant in his particular culture he expresses its concepts within the formalized traditions of the tribal domain. His attitude toward his work is regarded by some critics as being influenced by his belief in a universal essence derived from the natural forces surrounding him.

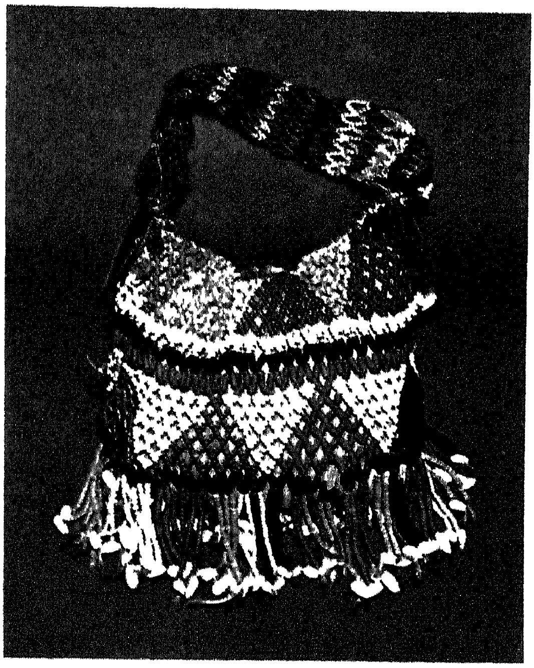
Traditional African art is based on reality as well as on the world of mythology. Modes of expression vary considerably from region to region. In some areas the art is entirely or partly naturalistic. In other areas the art is highly stylized and abstract. African tribal art has many affinities to modern abstract art but to the Western observer appears to reflect the attitudes and values of a given society rather than those of the individual artist.

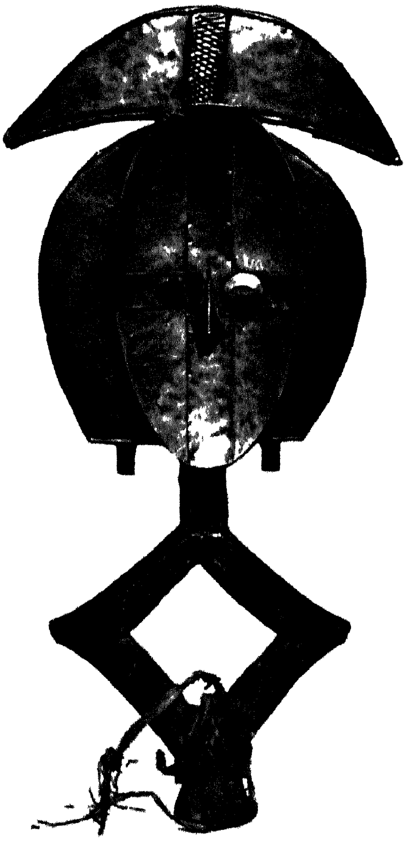
Sculpture is the predominant form of art among the African peoples. Often cubistic (see CUBISM) in appearance, it is characterized by the employment of rhythmically related plane and mass. Wood is the material most widely used in African sculpture. Brass casting is practiced in other areas as described below, most notably in the former Kingdom of Benin (now part of Nigeria). Other materials used include ivory, stone, clay, and iron.

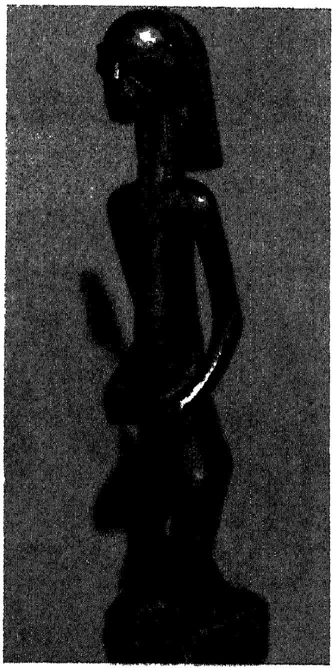
The most commonly found sculptural works are masks and statues. These were extensively employed in religious rituals, initiation and fertility rites, and other ceremonies. Masks, frequently of many colors, represent and celebrate deities and mythological heroes. Figures often commemorated ancestors or were used for purposes of divination. Among some tribes of the Congo area (Kongo, Teke, and Songe), fetishes are in use; see FETISHISM. The former court art of Ife and Benin in Nigeria, as well as of Ghana, Cameroon, and the Congo, produced royal commemorative imagery, insignia of rank, and (in the case of Benin) a wealth of ivory objects and brass plaques depicting the king and his court in various royal pursuits. The Ashanti of Ghana are known for their gold emblems and cast-brass gold weights. Decorative and utilitarian art objects produced by African artists include neckrests, stools, bowls, horns, axe and knife handles, cups, and textiles. Personal ornaments, such as amulets, are important.

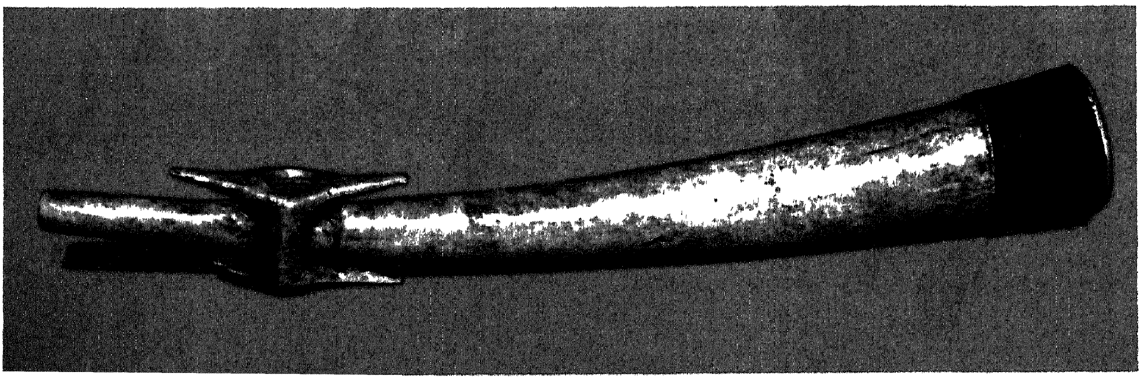
The history of African art dates from the

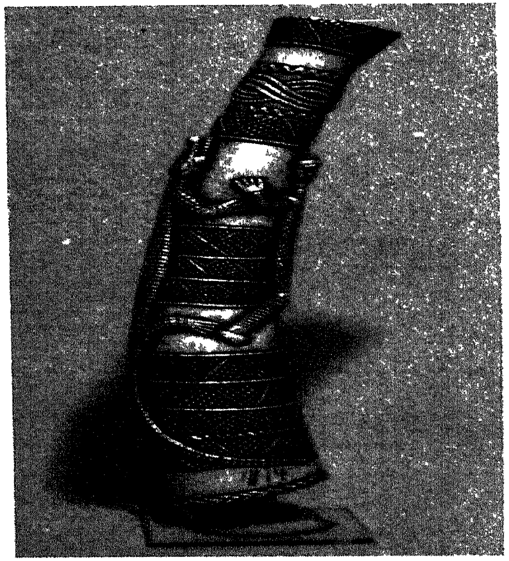
Art of the African Continent. Plate 1. *Right* An unusual example of African craftsmanship from the Somali region *Below, left* A wooden ritual object overlaid with brass plates, from the central part of Africa *Below, right* An ebony figure carved in Eastern Africa *Bottom* An ivory trumpet, from the White Nile region

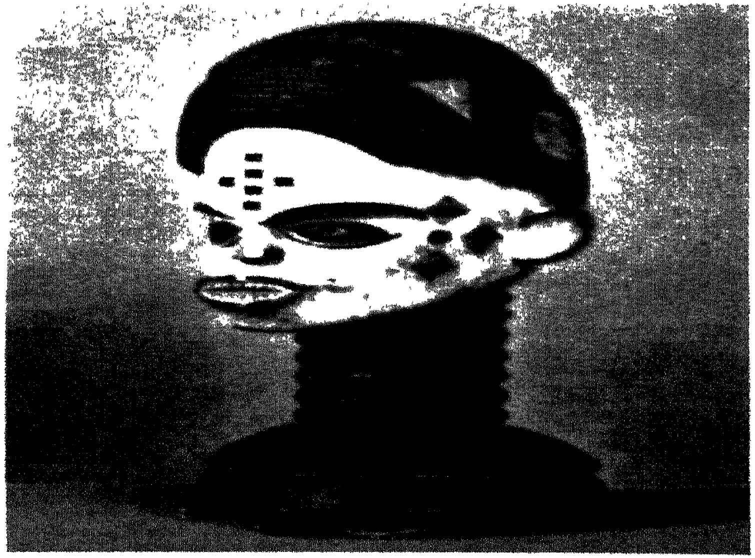












Art of the African Continent. Plate 2. Above, left: A Benin ivory statuette. Above, right: An ancient wooden mask by an Ibo artisan. Below, left: A Guinean ritual mask representing 'mother earth.' Below, right: Section of a cave painting featuring hunters and quarry, in the Orange River valley.

Paleolithic Era, *see* ARCHEOLOGY *Old Stone Age* Rock paintings found in north, south, and east Africa are the earliest manifestations of African art The wall paintings at Tassili n'Ajjer in present-day Algeria date from 4000 B C Of particular interest are paintings done by Bushmen in southern African caves Terra-cotta objects found in Nok in northern Nigeria are now dated from as far back as 300 B C The terra-cotta and brass heads from Ife in southwestern Nigeria are believed to have originated as early as 1000 A D Artists at Benin, artistic heir of Ife, employed the *cire-perdu* (lost-wax) method of brass casting to produce a large body of hollow brass and bronze sculpture that has been classified into three periods early Benin (14th to mid-16th century), middle Benin (mid-16th to late 17th century), and late Benin (1700–1897). African art history is only now being established For most of the continent it yet remains undetermined This circumstance is to some degree the result of the fact that wood was the chief material used by the tribal artist, with the exceptions noted above Wood, a highly perishable material, cannot long withstand the effects of tropical weather and insects. Among other factors accounting for a certain paucity of extant African sculpture, including even those objects fashioned of more durable materials, were tribal customs that seldom encouraged the preservation of such ritual paraphernalia as masks and figures.

Among the tribes of Africa, those that inhabit western Africa and the Congo display exceptional creative skill as artists, and their artistic traditions are deeply rooted. The principal tribes engaged in wood carving, brass casting, or both, are the Baga of Guinea; Dan of Liberia, Dogon and Bambara of the Republic of Mali; Mossi and Bobo of Upper Volta, Senufo, Baule and Guro of the Republic of the Ivory Coast; Akan tribes of Ghana; Fon of the Republic of Dahomey; Yoruba and Edo of western Nigeria; Mambila and Tiv of northern Nigeria; Bamileke of Cameroon; Fang, Kota and Mpongwe of Gabon Republic; Lumbo and Teke of the Republic of Congo (Brazzaville); and Ngbaka, Zande, Mangbetu, Kuba, Luba, Chokwe, Songe, and Kongo of the Republic of Zaire. Among the nomadic tribes of east and south Africa, traditional oral literature is a more common form of artistic expression than sculpture.

Early in the 20th century, African art began to exert a profound influence on Western art. In particular, the Fauvist (q.v.) artists were greatly attracted to African sculpture. Beginning about 1908, it influenced the work of the cubists, among them the Spanish painter Pablo Picasso, the French painter Georges Braque, the Rumanian sculptor Constantin Brancuşi, and the Italian painter and sculptor Amedeo Modigliani (qq v.) The resultant quest by galleries, private collectors, and tourists for African sculpture inevitably corrupted tribal standards of artistry in many areas.

See also AFRICAN LANGUAGES, AFRICAN LITERATURE, AFRICAN MUSIC, ISLAMIC ART AND ARCHITECTURE, and articles on various nations of Africa mentioned above J G L

AFRICAN DAISY. *See* ARCTOTIS

AFRICAN INTERNATIONAL ASSOCIATION. *See* ZAIRE, REPUBLIC OF. *History*

AFRICAN LANGUAGES, languages indigenous to the African continent More than a thousand different languages are spoken in Africa. Apart from Arabic (*see* ARABIC LANGUAGE AND LITERATURE), which is not confined to Africa, the most widely spoken African tongues are Swahili and Hausa (qq v), each with over 10,000,000 speakers. Several languages (often inaccurately termed dialects simply because they have few users) are spoken by only a few thousand people On the average an African language has about 200,000 speakers, only a few dozen languages have more than 1,000,000 speakers Although very few African languages have written literatures, the majority of them have longstanding traditions of oral literature

According to the most recent and widely accepted scholarly practice, the languages of Africa are grouped into four language families: Afro-Asiatic, Nilo-Saharan, Khoisan, and Niger-Kordofanian A language family is a group of related languages presumably derived from a common origin, a family is often subdivided into branches composed of more closely related languages. At least some of the African linguistic families are believed to have a history dating back well over 5000 years. African languages that belong to different families are as little alike as English, Turkish, Chinese, and Navaho, although the disparate tongues may be spoken in the same locality. Even within a single family, African languages may be as different in sound and structure as are English, Italian, Russian, and Hindustani, which are all members of the Indo-European language family Within a given branch of one family, however, languages are often as closely related as are German, Dutch, and Swedish

Writing systems exist for only about half the languages of Africa, and in certain tongues the only written literature is a translation of some portion of the New Testament. Except for Arabic and certain languages of Ethiopia, the alphabets of most African languages are based on adaptations of the Roman alphabet and were introduced by missionaries. A few tribes, notably the Vai in Liberia and the Bamum in Cameroon, have developed their own syllabic writing systems.

The first European students of African languages were usually missionaries, who, more than the members of any other group, have been concerned with learning to speak with the native population and with preparing literature for them. Much of the available information on African languages still comes from missionary sources. A major early work on African languages is the *Polyglotta Africana,* by the missionary-teacher Sigusmund W. Koelle (1823–1902); it contains a list of some 300 words and phrases in 156 different African languages; Koelle's information came from freed slaves living in the British West African protectorate of Sierra Leone. Twentieth-century scholars, such as the German linguists Carl Meinhof (1857–1944) and Diedrich Westermann (1875–1956), the South African linguist Clement Martyn Doke (1893–   ), and such British linguists as Ida Caroline Ward (1880–1949) and Malcolm Guthrie (1903–), have made substantial contributions to the knowledge of these languages and the relations of these languages to one another. The American linguist and anthropologist Joseph H. Greenberg (1915–) significantly revised earlier notions of the groupings of African languages, although some modifications and refinements of his 1963 classification can be expected from the increasing number of scholars in the field.

It is often suggested that the indigenous languages of Africa will eventually give way to internationally important European languages, or at least to a few of the major languages native to Africa. In spite of an increasing number of African contacts with Europe and the United States, however, little likelihood exists that many African languages will disappear within the next few centuries. As Africa develops, more and more speakers of minor languages will probably also learn at least one major African language and possibly a European language as well; but the use of the mother tongue in the family circle and in village and tribal affairs will doubtless persist much longer than most people expect. The emergence of independent African states has been accompanied by a resurgence of interest and pride in the indigenous languages of Africa in many parts of the continent.

The Afro-Asiatic Family. The Afro-Asiatic languages constitute the most important group of languages spoken in North Africa. The Semitic branch of the family includes languages spoken in Asia as well as in Africa. Arabic, the leading member of this branch, is the major language of North Africa and of the Republic of the Sudan. Amharic, which is spoken by more than 5,000,000 people, is the official language of Ethiopia; see AMHARIC LANGUAGE. The national book of Ethiopia, *Kebra Nagast* ("The Glory of the Kings"), is written in ancient Ethiopic, or Geez, now no longer spoken. Geez literature also includes several books of the Apocrypha not preserved in any other language; see BIBLE: *The Apocrypha.* Other Semitic languages spoken in Africa include Tigrinya and Tigre in Eritrea, the northernmost region of Ethiopia. *See* SEMITIC LANGUAGES

Languages of the Berber branch of the Afro-Asiatic family are spoken by a substantial portion of the population of Morocco, Algiers, and Tunisia, by scattered groups elsewhere in North Africa, and along the southern fringes of the Sahara Desert in western Africa. The Cushitic branch, confined to Ethiopia, the Somali Republic, and the Red Sea coast, includes such major languages as Galla and Somali. Ancient Egyptian, which has no living descendant, was another branch of the Afro-Asiatic family; see EGYPTIAN LANGUAGE AND LITERATURE. The Berber (q.v.), Cushitic, and Egyptian branches were at one time grouped together as Hamitic languages (q.v.), but this grouping is no longer favored by most experts.

A number of languages spoken largely in northern Nigeria form another Afro-Asiatic grouping, known as the Chadic branch. By far the most important Chadic language is Hausa, one of the two largest languages of sub-Saharan Africa. Hausa is widely used in education and trade, even in regions far beyond its original borders. Several Hausa newspapers are published, and the body of Hausa literature is growing.

The Nilo-Saharan Family. The Nilo-Saharan languages are found in a broken chain from the great bend of the Niger R. in West Africa to Ethiopia, throughout most of the upper Nile valley, and in parts of Uganda and Kenya. The westernmost member of this family is Songhai, located along much of the upper Niger R. The Saharan branch of this family includes languages spoken in northeastern Nigeria, through the Republic of Chad to the east, and into the oasis settlements of Libya to the north. Although most of this area is sparsely populated, Kanuri, the major language of the Saharan branch, is spoken by about 1,500,000 people

Languages of the Chari-Nile branch are spoken in the northern part of the Republic of Chad, in the Sudan, in much of Uganda and Kenya, and in the northeastern corner of the Republic of Congo Along the Nile R near the southern border of the Arab Republic of Egypt and in scattered areas to the southwest are the Nubian languages, Chari-Nile languages spoken by about 1,000,000 people Nubian religious documents dating from the 8th to the 14th centuries form the only literature of a living African language that was written before the modern period In the southern Sudan and in northern Uganda and Kenya a group of languages known as Nilotic belongs to this branch, important representatives are Dinka, Nuer, Shilluk, and Acholi (or Luo). Languages spoken farther to the southeast, including Masai in Kenya, have long been called Nilo-Hamitic, recent investigations, however, appear to prove that these tongues have no direct relationship to languages of the Afro-Asiatic family, but are most closely related to the Nilotic languages.

The very small Maban and Koman groups, and the single language Fur, also belong to the Nilo-Saharan family.

In many Nilo-Saharan languages, a system of noun suffixes indicates grammatical relationships, this system somewhat resembles the case system of Latin (q.v.), but is quite unlike that of any other family of languages in Africa In the northern Nilotic languages, similar grammatical relationships are expressed by an extremely complex system of internal vowel changes; many of the vowel sounds themselves are unusually difficult for the learner. Various verbal constructions are indicated by series of suffixes in some Nilo-Saharan languages (for example, Kanuri), or by both prefixes and suffixes in others (for example, the southern Nilotic languages) Many of these languages have a characteristic passive construction that is used much more freely than its counterpart in English. For example, "He bought cloth" is usually expressed as "Cloth was bought by him". This sentence can be shortened to "Cloth was bought" The action (buying) and the object (cloth) form the basic part of the sentence; the person who performed the action is comparatively unimportant

The Khoisan Family. The Khoisan languages comprise by all odds the smallest language family in Africa, with probably no more than 100,000 speakers altogether. Most of these languages are spoken by the Bushman and Hottentot peoples of southern Africa; the largest of them is Nama, with about 25,000 speakers. Far to the northeast in Tanzania are two other representatives of this family, Sandawe, with about 23,000 speakers, and the much smaller Hadza The Khoisan languages are best known for the unusual click consonants characteristic of most of them, in some Khoisan languages nearly every word begins with a click When these languages are written, the clicks are represented either by otherwise unused letters such as C, Q, X, or by special symbols such as /, !, // Some of the Khoisan languages have a system of grammatical gender, which is found elsewhere in Africa only in the Afro-Asiatic family

The Niger-Kordofanian Family. This family includes two subfamilies, Niger-Congo and Kordofanian Of these, the Kordofanian languages are only about thirty in number, and all of them are small, they are found in a small area of the Nuba hills in the southern Sudan, surrounded by languages of the Nilo-Saharan family and by Arabic. The Niger-Congo linguistic area, on the other hand, comprises almost all of the African continent below the Sahara Desert Although migrations presumably separated certain branches of the Niger-Congo subfamily more than 5000 years ago, languages in each of the branches have similar words for many common objects and actions; the still more distantly related Kordofanian languages have a few such similar words, and show some striking resemblances to the Niger-Congo languages in grammatical structure In contrast to the small number of speakers in the Kordofanian subfamily, about three out of four African natives speak languages that belong to the Niger-Congo subfamily.

The relationship among most of the languages of southern and central Africa has been recognized for over a century. These languages have become widely known as Bantu (a word meaning "the people" in many languages of the group). Some of the more important Bantu languages are Zulu and Xhosa in South Africa; Makua in Mozambique; Nyanja in Malawi, Shona in Rhodesia; Bemba in Zambia; Kimbundu and Umbundu in Angola, Swahili and Sukuma in Tanzania, Kikuyu in Kenya; Ganda in Uganda; Rwanda in Rwanda, Rundi in Burundi, Ngala and Kongo in the Republic of Congo and the Republic of Zaire, and Fang and Bulu in Cameroon Some Bantu authors are now beginning to produce literature in their native languages.

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The Bantu languages do not constitute a separate family, but should logically be grouped with certain languages of Nigeria, such as Tiv and Birom. All of these languages together are classified as the Benue-Congo branch of the Niger-Congo subfamily. It is by far the largest branch; the Bantu section alone numbers more speakers than all the rest of the Niger-Congo languages combined.

North of the Bantu language area, in the northern Republic of Congo and adjacent territory, is a second branch of the Niger-Congo subfamily, the Adamawa-Eastern branch. Its largest members are Zande and Ngbandi; a dialect of Ngbandi known as Sango is widely used as an intertribal language in the Central African Republic, and is growing in importance.

From Nigeria west, five additional branches of the Niger-Congo subfamily, which have frequently been called West Sudanic languages, are found. A group of three or four closely related languages in the Niger Delta, together known as Ijo, constitutes one of the five branches.

In a strip along the coast from southeastern Nigeria to Liberia are found the languages of the Kwa branch. This branch includes such important languages as Efik, Igbo, and Yoruba in Nigeria; Ewe in Togo and Ghana; Fanti and Twi in Ghana; Anyi and Baule in the Ivory Coast; and Bassa and Kru in Liberia. Several of these languages are used in schools, and a small but growing body of published literature exists.

North of the Kwa language region, extending from western Nigeria into much of the Ivory Coast and Mali, are the languages of the Gur branch, including Moré in Upper Volta with about 2,000,000 speakers.

Along the Atlantic coast, from Liberia to the desert north of Dakar, are several languages of the West Atlantic branch. These include Temne in Sierra Leone, Wolof in the vicinity of Dakar, and Fula (also known as Fulani, Fulfulde, or Peulh), by far the most widely spoken. Two large concentrations of Fulani-speaking people exist, one in Guinea and the other rather far to the east in Nigeria and Cameroon. Between these widely separated areas, Fulani-speaking people are scattered in numerous camps in which they raise cattle and sell meat, milk, and butter to neighboring tribes. Fulani is not, as has sometimes been thought, a Hamitic language.

Speakers of languages of the Mande branch inhabit most of the remaining portion of West Africa. One Mande language, known in various areas as Malinke, Maninka, Mandingo, Bambara, and Dyula, is spoken by some 3,000,000 people from Senegal through much of Mali and northern Guinea, and into the northern Ivory Coast. Other important Mande languages are Mende in Sierra Leone and Kpelle in Liberia. Small islands of Mande-language speakers are also scattered through areas farther east, as far as western Nigeria. The name Mandekan has recently been proposed as a name for the language as a whole, and has gained substantial acceptance. The Mande languages are believed to be the oldest offshoots of the parent Niger-Congo language spoken more than 5000 years ago.

The Bantu languages, now recognized as part of one branch of the Niger-Congo subfamily, have a system of noun classification that was formerly considered unique. In Swahili, a Bantu tongue, one group of nouns has a prefix *m* to indicate the singular and a prefix *wa* to indicate the plural; for example, *mtoto* ("a child"), *watoto* ("children"). Another group of nouns has a singular prefix *ki* and a plural prefix *vi*; for example, *kikapu* ("a basket"), *vikapu* ("baskets"). Words modifying a noun require corresponding prefixes; for example, *mtu mzuri* ("a good person"), *watu wazuri* ("good people"), *kikapu kizuri* ("a good basket"), *vikapu vizuri* ("good baskets"). Corresponding prefixes for some modifiers, and corresponding pronouns meaning "he", "she", "it", or "they", are not identical with the noun prefixes in all cases. Each set of prefixes and pronouns, whether singular or plural or neutral (such as the prefix *u* in *uhuru*, "freedom"), defines a class of nouns and its grammatical concords. A typical Bantu language may have from twelve to more than twenty noun classes.

Classification systems of the type described in the preceding paragraph are actually characteristic of languages belonging to all branches of the Niger-Congo subfamily except the Mande branch, and also of languages in the Kordofanian subfamily; this type of system was presumably present in the parent Niger-Kordofanian language thousands of years ago. Some languages of the Gur branch indicate the noun class by both prefix and suffix, and others by suffix only, but all have separate pronouns for each class, as do the Bantu languages. Many of the Kwa languages have noun prefixes, but no other characteristics of a class system. Some striking similarities are found throughout the Niger-Congo subfamily; for example, a class indicator such as *m* with words for oil, water, and other liquids.

Although grammatical structure among the Niger-Kordofanian languages varies considerably, in general these tongues emphasize the kind of action referred to (grammatical aspect), or the attitude toward the action (mode), rather than the time of the action (tense). Different constructions may indicate customary action ("He laughs all the time"), potential action ("He is likely to get sick"), experiential action ("He has met the chief"), hortative attitude ("He should go"), desiderative attitude ("If only he would come"), and so on In many languages, the only construction referring primarily to time is one for the past tense. Such constructions, for which English often uses long phrases, are distinguished in Niger-Kordofanian languages by a single prefix, suffix, or particle, or even by a slight modification of a pronoun or verb form On the other hand, passive constructions are rare or nonexistent in the non-Bantu languages of this family Prepositions are also rare, ideas of motion ("to, from, up") are typically incorporated in verbs, while ideas of location ("under, beside, in") are typically incorporated in nouns

With few exceptions, the languages of the Nilo-Saharan, Niger-Kordofanian, and Khoisan families, as well as the Chadic languages and a few of the Cushitic languages in the Afro-Asiatic family, are tone languages, that is, distinctions in the pitch of a single syllable may differentiate completely different words or different grammatical functions of a word or of a prefix or suffix. For example, in a dialect of Jukun, a language of Nigeria, *kwī* with a high pitch means "knife", *kwī* with an intermediate pitch means "millstone", and *kwī* with a low pitch means "chicken" In the same dialect, *ku bi* with both syllables on an intermediate pitch means "He came", but *ku bi* with the first syllable on a high pitch means "Have him come". In scores of Niger-Congo languages, different pronouns may differ only in pitch. Distinctions in pitch or tone have generally been ignored in writing, in spite of the fact that they are often crucial to understanding what the writer intended to say; tone is described, and indicated by accent marks or other devices, in a relatively few modern grammars and dictionaries of African languages.

Prior to 1959, academic involvement in African language studies was confined to a very few universities in England and Europe. Since then, a number of American universities, as well as the Foreign Service Institute of the U.S. Department of State, have begun teaching and research programs focused on African languages. With less emphasis on the implications of scientific linguistics for teaching and research, a number of other universities, colleges, and even high schools offer instruction in a single African language, usually Swahili. W.E.W.

AFRICAN LITERATURE, oral and written literature of the continent of Africa, not necessarily in the languages indigenous to Africa.

Oral Literature. Africa has a rich and varied oral literature, which has grown since the beginnings of African societies and continues to flourish even today The written literature of Africa has always shown a debt to the oral literature, which takes a variety of forms Proverbs and riddles convey the accepted social codes of conduct, while myths and legends teach a belief in the supernatural as well as explain the origins and development of states, clans, and other important social organizations Legends and myths are usually regarded as grounded in fact, in many instances, they have proven to be extremely accurate accounts of the history of a people Folktales, on the other hand, are recognized as fiction The most famous African folktales have the tortoise, hare, and spider as their main characters Similar folktales are widespread on the continent and have been carried from Africa to the Caribbean, Latin America, and the United States.

In the 20th century, largely through the efforts of anthropologists and historians, a good portion of the oral literature of certain areas, such as Southern Africa, Ruanda, Buganda, and parts of the Congo region, have been recorded

Early Written Literature. The earliest written African literature is North African Because of the intimate connections between North Africa and the Mediterranean and Arabic worlds, the writings of North Africans, such as those of the Christian theologian Saint Augustine and the Arab historian ibn-Khaldun (qq.v.), have had profound impacts beyond Africa. But because North African life and thought have been more closely tied to Europe and the Middle East than to the rest of Africa, the early literature of this part of the world should be treated with ancient Roman and Arabic literature. *See* ARABIC LANGUAGE AND LITERATURE, LATIN LITERATURE

Much of the early written literature of West Africa was influenced by Muslim writings, as transmitted by North Africans, in both form and content The earliest known West African works were 16th-century writings by such Sudanese Muslim scholars as Abd al-Rahman al-Sadi (1596–about 1655), the author of *Tarikh as-Sudan* ("History of the Sudan"), and Mahmud Kati (1468–?), who wrote *Tarikh al-Fettach.* These works set down the oral traditions of the western Sudanic empires of Ghana, Mali, and Songhai in the style of Arabic histories.

The earliest West African written poetry tended to be religious, and the best of it reflected a familiarity with pre-Islamic Arabic poetry as well as North African religious writing. Perhaps the most famous West African religious poet was Abdullah ibn Muhammed Fudi (1767–1828), Emir of Gwandu and brother of Muslim reformer Shedu Uthman (about 1754–1817).

The written literature of East Africa has an equally long history and also shows the influence of Arabic models. An anonymous history of the city-state of Kilwa Kisiwani, written about 1520 in Arabic, is the earliest known example of East African written literature. Written Swahili versions of the histories of a number of city-states as well as "message" poems, usually written with a moral or religious point of view, soon began to appear. The earliest-known original Swahili work, the epic poem *Utendi wa Tambuka* ("Story of Tambuka"), is dated 1728.

Swahili poetry was largely derived from Arabic poetry. Swahili writers of epic verse borrowed from the romantic traditions surrounding the Prophet Muhammad (q.v.), and then freely elaborated on them to meet the tastes of their listeners and readers. By the 19th century, Swahili poetry had gone beyond the themes of Arabic works and had taken up such indigenous Bantu forms as ritual songs.

The most famous Swahili poems date from the 19th and 20th centuries. The greatest religious poem, *Utendi wa Inkishafi* ("Soul's Awakening"), written by Sayyid Abdallah bin Nasir (about 1720–about 1820), illustrated the vanity of earthly life through an account of the fall of the city-state of Pate. The oral tradition of Liyongo, a 13th-century contender for the throne of Shagga, was preserved in the epic poem *Utendi wa Liyongo Fumo* ("Epic of Liyongo Fumo"), written by Muhammad bin Abubakar in 1913.

Although the Sudanic areas of West Africa and the coastal areas of East Africa had a rich written literature predating contact with Europeans, the literature of the rest of sub-Saharan Africa remained oral until the arrival of Europeans and the establishment of mission and government schools.

Among the first Africans to write in English was Olaudah Equiano (fl. 18th cent.), who was kidnapped as a child from the Benin region of Nigeria and shipped to the United States as a slave. As a free man in Great Britain, he wrote an autobiography (1789) under the pen name of Gustavus Vasa.

Contemporary Literature. Near the beginning of the 20th century, Africans began to publish creative writings in a number of African and European languages. In South Africa a number of skilled poets and novelists appeared. Samuel E. K. Mqhayi (1875–1945) wrote extensively in Xhosa and showed its strength as a medium for written literature. Novelists like Thomas Mofolo (1875?–1948) and Solomon T. Plaatje (1877–1932) were provoked by the disrespect with which white South Africans treated black Africans; in their writings they sought to portray black Africans as complex, moral human beings. Mofolo's third novel, *Chaka the Zulu* (Eng. trans., 1931), is a fictional treatment of a Zulu warlord who was a major African figure in the early 19th century. Written in 1925 in his native Sotho, the book is considered a classic in that language. Plaatje's novel *Mhudi*, a historical romance about Chaka's lieutenant Mzilikazi, was published in 1930. Plaatje's style, which incorporates praise songs, is in the tradition of Bantu oral literature. In the mid-20th century many black South African writers left their homes because of government policies. Among those who left were Peter Abrahams (1919?–) and Ezekiel Mphahlele (1919–). *Tell Freedom* (1954), an autobiography, is considered Abrahams' best work; in it he writes of the racial oppression he suffered as a child in Johannesburg. Mphahlele is a major critic of black African literature. In his work *The African Image* (1962), he discusses both black and white African literature; he deplores its obsession with race relations and calls for a broader and deeper treatment of characters from a more basically human point of view. Other noted writers are A. C. Jordan (1912?–68),

Thomas Mofolo, South Africa

Evangelical Missions Society of Paris

Peter Abrahams, South Africa. Granger Collection

Chinua Achebe, Nigeria Nigerian Ministry of Information

writing in Xhosa, and R. R. R. Dhlomo (fl. early 20th cent.), a Zulu poet. Prose writers Alex La Guma (1925–) and Bloke Modisane (1923–) and playwright and critic Lewis Nkosi (1935–) all became known after 1950. Dennis Brutus (1924–) is the best-known black South African poet. His most famous work, *Sirens Knuckles Boots,* shows the effects of racial repression on everyday life.

White South Africans have a long tradition of creative writing. A number of poets, such as Eugene Marais (1871–1936), D. J. Opperman (1914–), and Elisabeth Eybers (1915–), have produced a rich literature. Writers with international followings include Alan Paton (q.v.), whose most famous work, *Cry, the Beloved Country,* appeared in 1948, and Doris Lessing (1919–).

Poetry has been the dominant literary form among Africans writing in French. Léopold Sédar Senghor (q.v.), the poet-president of the Senegal Republic, led the *Négritude* movement, which was extremely influential in shaping the thinking of French-speaking intellectuals. *Négritude,* which reached its height in the 1930's and 1940's, was a protest against the French policy of assimilation of black Africans into the French-Catholic way of life and a reassertion of the positive values of African culture. Birago Diop (1906–) and David Diop (1927–60), both poets, were also associated with the movement.

Only a few West African novelists produced works in French. However, these writers have been among the most talented on the continent. Camara Laye (1928–) of Guinea is remarkable for the psychological insights of his novels. His autobiographical novel *L'Enfant Noir* (1953, Eng. trans., *The Dark Child,* 1954) is considered a masterpiece; his second work, written in 1954, was translated as *The Radiance of the King* in 1956. Cameroon has produced two novelists, Mongo Beti (1932–) and Ferdinand Oyono (1929–), who have written extremely powerful and searching satire.

West Africans writing in English produced little of note until the 1940's. Since then, however, an impressive body of literature has been created. Nigeria in particular has many writers. Amos Tutuola (1920–) and Chinua Achebe (1930–) are the most important Nigerian novelists. Tutuola became internationally known after publication of *The Palm-Wine Drunkard* (1952). Written as legend and myth, the work has been compared by English critics with the allegorical masterpiece *The Pilgrim's Progress* by the English writer John Bunyan (q.v.). Achebe examined the threat posed by Western civilization to traditional values in his early novels *Things Fall Apart* (1958), *No Longer at Ease* (1960), and *Arrow of God* (1964). *A Man of the People* (1966) was a disturbing political satire on corruption in an unnamed African country.

Wole Soyinka, Nigeria Nigerian Ministry of Information

Wole Soyinka (1935–), leading Nigerian poet dramatist, has written a number of plays with strong Yoruba themes In his novel *The Interpreters* (1966), Soyinka interprets both modern Nigeria and ancient tradition and satirizes the new Nigerian bourgeoisie Ijaw myths and social situations have been used in a provocative way by the Nigerian poet and playwright John Pepper Clark (1935-). The Nigerian poet Gabriel Okara (1921–) wrote *The Voice*, one of the few African novels to concentrate exclusively on African characters and values. The best-known novelist from Sierra Leone is William Conton (1925-). His *The African* (1960), the story of a young African who has been educated in England, accentuates cultural differences between Western and African life

Ghana produced a man who is considered to be one of Africa's most exciting poets, George Awoonor-Williams (1935–). His works treat the conflicts of life and the ominous presence of death. Ayi Kwei Armah (1939–), a Ghanaian novelist, captured the texture of life in the last days of the regime of Ghanaian President Kwame Nkrumah (1909–72) in his extremely realistic novel *The Beautiful Ones Are Not Yet Born* (1968).

Contemporary literature of East Africa includes important autobiographical works, such as those of Kenyans Josiah Kariuki (1929–75), who wrote *Mau Mau Detainee* (1963), and Mugo Gatheru (1925–), who wrote *Child of Two Worlds* (1964) A younger Kenyan writer, James Ngugi (1938-), is the author of several short stories and novels and one play His works deal with the impact of Christianity on African life and are remarkable for their clarity and simplicity of writing Jean Joseph Rabearivelo (1901–37) of Madagascar (now Malagasy Republic) wrote in French and is considered one of the greatest African poets After modeling his earlier poems on French Symbolist writings, Rabearivelo turned to a brilliant use of the vernacular ballad form of Madagascar He exerted a great influence on the style of two of Malagasy's leading poets, Jean Jacques Rabemananjara (1913-) and Flavien Ranaivo (1914-). Shaaban Robert (1909-62) of Tanganyika (now Tanzania) was East Africa's leading Swahili poet and essayist His best known work *Kusadikika* ("To Be Believed", 1951), examines political trends in Tanganyika The work is an allegory patterned on *Gulliver's Travels* by the British writer Jonathan Swift (q.v.) The most widely read work in East Africa, however probably remains William Shakespeare's *Julius Caesar* as translated into Swahili in 1966 by Tanzania's president Julius Kambarage Nyerere (1922-) Nyerere's translation of Shakespeare's *The Merchant of Venice* was published in 1969 J.T.Sa. & W.E.W.

AFRICAN METHODIST EPISCOPAL CHURCH, Protestant denomination organized in Philadelphia, Pa., in 1816 On matters of doctrine and polity the denomination is in basic agreement with The Methodist Church (see METHODISM). A quadrennial General Conference is the chief policy making body, and spiritual jurisdiction is exercised by a Council of Bishops The church has eighteen episcopal districts, including four in Africa

In addition to missionary activity within the United States, the denomination maintains missions in Africa, South America and the Virgin Islands Its periodicals include the *A.M.E. Review* and the *Voice of Missions*

The first congregation of what later became the African Methodist Episcopal Church was formed in 1787 by a group of Negro parishioners of St George's Methodist Church in Philadelphia Led by the itinerant preacher and former slave Richard Allen (1760–1831), they withdrew from the church in protest against a display of racial prejudice The seceding group held religious services in a hired storeroom. Similar Negro congregations were subsequently formed in the city, and in 1816 Allen, who had become a prominent Methodist preacher, took the lead in organizing the groups into a separate denomination, the African Methodist Episcopal Church Elected the first bishop, he was ordained by the Anglo-American bishop, Francis Asbury (q.v), of the Methodist Episcopal Church Immediately after the Civil War, the denomination sent missionaries into the South Largely through their labors, the membership increased in ten years from 70,000 to 390,000

According to the latest available figures, the African Methodist Episcopal Church reported more than 1,165,000 members and about 5875 separate congregations It is the second-largest Methodist denomination in the U S

AFRICAN METHODIST EPISCOPAL ZION CHURCH, Protestant denomination founded in New York City by a group of Negro congregations formerly belonging to the Methodist Episcopal Church Its doctrine and polity are basically Methodist (*see* METHODISM), and its chief policy-making body is the quadrennial General Conference A bishop presides over each of the twelve episcopal areas.

In addition to missionary activity within the United States, the church maintains missions in Africa, the West Indies, and South America. Publications include *Star of Zion*, the *Quarterly Review*, and *Missionary Seer*

In 1796, a group of Negro parishioners of the John Street Methodist Episcopal Church in New York City, discontented over the smallness of their role in the management of church affairs, organized a separate Negro congregation with the approval of the Anglo-American bishop, Francis Asbury (q.v.), of the Methodist Episcopal Church. The group continued to meet in the John Street church until 1800 when they erected their own building, which they called Zion In 1820 the group formally withdrew from the Methodist Episcopal Church, and in 1821, together with congregations from Connecticut, New Jersey, and Pennsylvania, held their annual conference at which James Varick (1750?–1828), leader of the original dissenters, was elected the first bishop. It was not until 1848, however, that the name African Methodist Episcopal Zion Church was adopted

This movement spread rapidly over the northern States, but its major growth followed the end of the Civil War; between 1866 and 1868 its membership increased four-fold, the new recruits being largely southern Negroes.

According to recent estimates the denomination has 1,100,000 members and about 4600 separate congregations. The African Methodist Episcopal Zion Church is the third-largest Methodist organization in the U.S.

AFRICAN MUSIC, music of the peoples of the continent of Africa (For the music of northern Africa, *see* ARABIC MUSIC) Many styles of African music exist, all, however, share the characteristic of being used in daily life. Work songs, lullabies, farm songs, and songs for relaxation and entertainment are found throughout Africa. Music also is played at formal events, such as weddings, funerals, or religious ceremonies At these events, masked and costumed performers participate with onlookers, singing and dancing to the rhythmic accompaniment of instruments and drums

Highly developed and subtle rhythms are typical of African music (*See* MUSIC *Elements of Music*) Frequently, several beat patterns are played simultaneously during a performance In a group of musicians, a master drummer may serve as leader. He unifies the ensemble and signals to the dancers when a change in mood or tempo is about to take place The master drummer also plays intricate solo passages that contrast with or further develop the rhythmic patterns played by the other musicians

Some master drummers can imitate speech on their instruments This is possible because in many African languages, the pitch at which a word is spoken affects its meaning By duplicating the pitch and accent patterns of spoken words and phrases, the drummer may recite legends and tales. Instruments of the trumpet and

The drum provides the basic rhythm of all African music UPI

flute families are also used to imitate speech in this way.

African weddings or other ceremonies usually feature singing by a chorus, which can include anyone present at the event. A soloist often leads the chorus in a series of alternating solo and choral sections. Songs of praise are often performed for the nobility. In them, long narrative poems describe the achievements of a chieftain and his forebears. These narratives may be accompanied by a drum or flute, or "spoken" by the drum itself. In many places special singers or drummers are designated to perform such music regularly.

African music makes use of an enormous variety of percussion, string, and wind instruments. In eastern Africa, players use large, bowl-shaped drums covered with animal hides and a tight web of twined laces. Drumming styles have become quite complex, especially in Uganda. Small harps or lyres provide accompaniment for solo songs, and ensembles of horn players enliven many festivities. In southeastern Africa, the Chopi of Mozambique have developed large xylophone orchestras in which instruments cover all ranges from bass to soprano.

Among the many types of drums found in the Congo area is a hollowed log with a slit in the upper surface. Developed to imitate speech patterns, this slit drum has been extensively used by some tribes for sending messages. The Congolese also play various forms of stringed instruments, including a type of zither and the arched harp.

Instruments of western Africa include the *dundun* pressure drum, used among the Yoruba of Nigeria for imitating speech. This drum has a wooden body carved in the shape of an hourglass with drumheads stretched across either end and connected by thongs. The player grasps the thongs with one hand and presses on them to change the pitch that sounds when the drum is struck.

In Guinea and Mali, a stringed instrument called the *kora* is plucked in intricate solo pieces. In Ghana, the drumming styles of the Ashanti people feature a number of independent drum parts supporting the part of the master drummer. The players often use tall, standing drums of wood; the drum skins are held in place by wooden pegs.

Many tribal groups in Africa sing for amusement or relaxation to the accompaniment of a small plucked instrument, sometimes called an *mbira,* or hand-piano, also used in solos. The *mbira* contains keys of metal, wood, or bamboo mounted on a flat surface with a sound box or gourd sometimes attached for additional resonance. The keys are plucked by both hands.

Other African instruments include bells, gongs, and gourd rattles, which are often used in ensembles to accompany dancing and singing. Although rattles usually play simple supporting rhythms, in some areas, such as Nigeria, rattle playing reaches the level of a complex art practiced by specialists.

See also AFRICA: *The People: Religion;* AFRO-AMERICAN MUSIC; ARABIC MUSIC.

D.L.T.

AFRICAN UNITY, ORGANIZATION OF. *See* ORGANIZATION OF AFRICAN UNITY.

AFRICANUS, Sextus Julius (fl. 3rd cent.), early Christian historian and traveler, born in Libya. He is known for estimating the date of the Creation in the *Chronographiae,* a history of the world from the Creation to 221 AD. He set the Creation 5499 years before the birth of Christ, and dated Christ's birth three years earlier than the usual reckoning. His estimates are adopted by most of the Eastern churches. Only fragments of the *Chronographiae* exist today.

AFRICAN VIOLET, tropical plant of the genus *Saintpaulia,* widely cultivated as a house plant. The African violet has heart-shaped, fuzzy-textured leaves and flowers of great beauty. Not a true violet, it is native to Africa. Mature plants are from 3 to 5 in. tall. Their flowers may reach an inch in diameter and usually grow in clusters on a slender stalk. The blossoms range in color from white through pink to purple. The plant grows best in a moderate climate and in soil that is rich in humus (q.v.).

AFRIDI, tribe of North-West Frontier Province, Pakistan, inhabiting the Afghan-Pakistan border region, a mountainous area that contains the Khyber Pass (q.v.). The tribe is related linguistically and ethnologically to the Pathans, a people of Afghanistan and Pakistan.

AFRIKAANS, language of the descendants of the early settlers of South Africa. Derived from Dutch dialects of the 17th century, the language also contains words of French, German, and African tribal origin. By the mid-18th century Afrikaans was established in South Africa, and in 1925 it became an official language of the Republic of South Africa.

AFRIKANERS *or* **AFRICANERS.** *See* BOERS; SOUTH AFRICA, REPUBLIC OF: *The People: Culture.*

AFRO-AMERICAN MUSIC, music of the African natives who were transported to America and sold into slavery, and of their descendants. As its name implies, this music combines elements from the musical heritages of both Africa, primarily western Africa, and America.

African Elements. The Negro slaves in America, as their ancestors in Africa had done for many centuries, used song or dance in almost all their daily activities—toil, celebrations, religious services From their African heritage the slaves adopted the patterns of their work songs, many of which were in a call-and-response form, a lead singer gave the line of melody and others joined in for the refrain The same pattern, as well as some of the actual African tunes, was carried over also into the Afro-American spiritual (q v) A vital feature of African folk music, the freedom allowed a performer to improvise elaborations of the melodic line, continued, too, in the spirituals and in the so-called blues (q v), Afro-American folk music for a solo singer without chorus (*see* FOLK MUSIC) Also derived from an African heritage is drumming, in which several rhythmic patterns in different meters are combined simultaneously By contrast, the Western custom is to use only one meter at a time The African interplay of different rhythms was carried over into the Afro-American instrumental music called jazz (q.v.)

The instruments that the early slaves used included real or makeshift drums and the banjo (q v.), an African variant of the guitar (q v.). The jagged melodic figurations that banjo players produce on the instrument were taken over into ragtime (q.v.), an Afro-American forerunner of jazz

Some of the harmonic features of West African music contributed the "blue" or "dirty" notes to Afro-American jazz These notes are the lowered third and seventh tones of the scale (q v.) In other ways the harmony of Western and West African music are quite similar, which is the main reason that these two otherwise different traditions could fuse into Afro-American music.

See also AFRICAN MUSIC

Western Elements. The American elements in Afro-American music are of European origin, for example, the use of Western instruments. Slaves who learned such instruments were highly prized by their American owners and often performed European dance music at society balls. During the 19th century Negroes learned to play more and more instruments. The transference of Negro rhythms and melodic improvisations to Western instruments was one of the major factors in the formation of jazz.

Another American element was hymn singing, particularly as taught by the Methodist and Baptist missionaries, who were more active than others in teaching Christianity to the Negroes. The American Negroes created their own hymns, sometimes called surge songs, in which they enlivened the music with spontaneous handclapping, melodic improvisation, and lively rhythms

The Negroes, who have shown an extraordinary ability to assimilate widely differing musical elements, have also made use of French, Spanish, and Caribbean music All of these musical currents were present in New Orleans, La , where jazz was born around 1900, and each contributed to the vocabulary of jazz as it was evolved by Negro musicians.

Current Sounds. In recent decades it has become increasingly difficult to isolate a distinct Afro-American music Throughout the world, folk music of all kinds has become increasingly rare in the 20th century The cross-influences of white and Negro jazz musicians from around the world make it impossible to speak of current jazz as either Afro or American The last vestiges of a living Afro-American musical tradition might be found in the vigorous hymns that are sung in Negro churches and in the Negro folk music that still survives in some southern areas of the United States.

AFZELIUS, Arvid August (1785–1871), Swedish writer, pastor, and collector of Swedish folk songs, born in Enkoping, Sweden From 1828 until his death he was pastor of the parish of Enkoping In collaboration with the Swedish historian and poet Erik Gustaf Geijer (q v), Afzelius compiled a collection of Swedish folk songs entitled *Svenska Folksvisor från Forntiden* ("Swedish Folk Tunes from Olden Times", 3 vol , 1814–17) His other works include poems, translations of ancient Swedish epic poetry, and a history of Sweden to the time of Charles XII (q.v.), King of Sweden

AGADIR, city and seaport of the Kingdom of Morocco, on the Atlantic Ocean, about 120 miles s.w of Marrakech. Situated within a mining region, cobalt, lead, manganese, and zinc are shipped by way of the excellent natural harbor of the city The chief industries in Agadir are fishing, fish canning, and the manufacture of light metal products. The city was founded as a Portuguese settlement around 1500, and came under Moroccan rule about 1536. In 1911, at the height of the controversy caused by Franco-German rivalry in Morocco, Germany sent the warship *Panther* to Agadir. The incident, which nearly precipitated a general European war, led to the establishment of a French protectorate in Morocco in 1912. In 1960 Agadir was devastated by two earthquakes, about 15,000 persons in the area lost their lives Rebuilding of the city was begun shortly thereafter. Pop. (1971 est.) 61,192.

AGA KHAN, name of a family of leaders of the Ismaili sect of Islam (*see* Muslim Sects: *Shi'ite Subsects: Ismailis Subsects*). The most important members of the family are the following.

Aga Khan I, real name HASAN ALI SHAH (1800–81), believed to be a descendant of the Prophet Muhammad (q.v.). Aga Khan was governor of the Province of Kerman, Persia (now Iran), until 1840 when he fled to India after an unsuccessful attempt to seize power in Persia. He helped the British government in India in its attempts to control frontier tribes. Aga Khan became leader of the Ismailis in India, Pakistan, Africa, and Syria.

Aga Khan II, real name ALI SHAH (d. 1885), son of Aga Khan I, served as leader of the Ismaili sect for four years after the death of his father. His reign also emphasized close ties with the British government in India.

Aga Khan III, real name AGA SULTAN SIR MAHOMED SHAH (1877–1957), son of Aga Khan II, born in Karachi, India (now in Pakistan), and educated in Europe. He became head of the Ismaili sect in 1885 after the death of his father and during World War I persuaded his followers and other Muslims to side with the Allies. In 1932 and from 1934 to 1937, he headed the Indian delegation to the Assembly of the League of Nations. A noted sportsman, his extreme wealth enabled him to maintain the most valuable racing stables in the world before World War II. He also contributed generously to the Aligarh Muslim University in India. He wrote *India in Transition* (1918) and *Memoirs* (1954).

Aga Khan IV, born PRINCE KARIM AL HUSSAINI SHAH (1936–), grandson of Aga Khan III, born in Geneva, Switzerland, and educated in Switzerland and at Harvard University. Aga Khan III nominated his grandson to head the religious sect, rather than a son, in the conviction that the Aga Khan should be "a young man brought up in the midst of the new age". *See also* Aga Khan, Prince Sadruddin; Aly Suliman Khan.

AGA KHAN, Prince Sadruddin (1933–), United Nations official, son of Aga Khan III (*see under* Aga Khan), born in France and educated at Harvard University. He has been associated with United Nations programs and refugee projects since 1958 and has served as United Nations high commissioner for refugees since 1962.

AGAMEMNON, in Greek mythology, King of Mycenae and commander of the Greek forces in the Trojan War (q.v.). He was the son of Atreus (q.v.) and suffered the curse laid on his house (*see* Atreus, House of). When the Greeks had assembled in Aulis for their voyage to Troy (q.v.) they were held back by adverse winds. To calm the winds Agamemnon sacrificed his daughter Iphigenia to the goddess Artemis (qq.v.). His quarrel with Achilles (q.v.) over the captive princess Briseis and its consequences form much of the plot of the *Iliad* (q.v.). After a ten-year siege, Troy fell and Agamemnon returned in triumph to Mycenae. With him he brought the Trojan princess Cassandra (q.v.), who had been awarded to him by the victorious Greek Army.

Clytemnestra (q.v.), Agamemnon's wife, greeted him with protestations of love, but while he was in his bath she threw a net over him. Her lover Aegisthus (q.v.) struck Agamemnon with a sword and while he was stunned from the blow, Clytemnestra beheaded him with an ax. His death was avenged seven years later by his son Orestes (q.v.). The story of Agamemnon's death is told in the first play of the trilogy *Oresteia* by the ancient Greek poet Aeschylus (q.v.).

AGAÑA, town and capital of the United States unincorporated Territory of Guam, on the W. coast of the island, about 5 miles S.E. of the naval installations at Apra Harbor. The town was totally destroyed in World War II during the American reconquest of Guam from the Japanese in 1944. Reconstruction began in 1946 with appropriations from the U.S. government. Pop. (1960) 1642; (1970) 2119.

AGAR-AGAR. See Bacteriology: *Culture*.

AGARIC. See Mushrooms: *Poisonous Mushrooms*.

AGASSIZ, name of two American scientists of Swiss origin, who were father and son.

Louis Jean Rodolphe Agassiz (1807–73), Swiss-American naturalist, born in Motiers, Switzerland, and educated at the universities of Zürich, Heidelberg, Erlangen, and Munich. In 1826 he prepared a description of Brazilian fishes from materials collected by the Bavarian naturalist Johann Baptist von Spix (1781–1826); the work attracted the notice of the French naturalist Baron Georges Cuvier (q.v.), with whom Agassiz afterward studied in Paris. From 1832 to 1846 Agassiz was professor of natural history at the University of Neuchâtel. During this time he prepared and published *Researches on Fossil Fishes* (1833–44, 5 vol., 311 plates) and, as a result of his researches on the glaciers of Switzerland, *Studies on Glaciers* (1840), in which he advanced the theory, then new in geology, of a glacial epoch (time when most of the earth was covered by glaciers). In 1846 Agassiz delivered a course of lectures at Lowell Institute, Boston, which resulted in his appointment in 1848 as professor of natural history in the Lawrence Scientific School of Harvard University. Although his later life was given to lecturing and exploration rather than to teaching, he held this position until his death. In opposition to the Darwinian theory of evolution (q.v.), Agassiz held the theory of epochs of creation. His explorations in the United States included the Lake Superior region (1848) and the Florida coral reefs (1850–51). From 1865 to 1866 he traveled in Brazil. His researches there were published under the title *A Journey in Brazil* (1868). In 1872 he made a journey to California around Cape Horn. He established a summer school of zoology in 1873 on Penikese Island, Buzzards Bay, Mass. Agassiz was one of the best-informed and most capable biologists of his day, and his ability to awaken interest in natural science was outstanding.

Alexander Agassiz (1835–1910), American zoologist, son of Louis Agassiz, born in Neuchâtel, Switzerland, and educated at Harvard University. In 1873 he became curator of the Museum of Comparative Zoology at Harvard. He held this post until 1885, when poor health forced him to resign. As administrator of the Calumet and Hecla copper mines on Lake Superior (1865–69), and as a stockholder in the mines, he acquired a fortune. His gifts to the Harvard Museum of Comparative Zoology and to other institutions for biological research totaled over $1,000,000. In 1874–75 he explored Lake Titicaca, between Bolivia and Peru, and in 1875 established an aquarium at Newport, R.I. From 1877 to 1904 he made annual expeditions to study the marine life of the western Atlantic and the Pacific oceans. He was an authority on jellyfish, echinoderms, and corals. N.E.M.

AGASSIZ, LAKE, immense glacial lake that formerly covered much of present-day N.W. Minnesota and N. North Dakota and S.W. Ontario and S. Manitoba, Canada. The lake existed in the Pleistocene Epoch (*see* QUATERNARY PERIOD) and was named in 1879 in honor of the naturalist Louis J. R. Agassiz (*see under* AGASSIZ). The historic existence of Lake Agassiz is indicated today by deltas, created where former rivers flowed into the lake, and by well-marked shorelines that can be traced for long distances. Lake Agassiz discharged only relatively small amounts of water because its natural drainage toward the N. was held back by the great Laurentide Ice Sheet. The outflow went through a channel 80 km (50 mi.) long from the S. end of the lake to the Minnesota R. and on to the Mississippi R. Because it retained so much water, the lake became very large; at its greatest extent it was about 1130 km (702 mi.) long and covered about 284,900 sq.km (110,000 sq.mi.). Lake Agassiz contracted drastically when the ice sheet melted sufficiently for an outlet to flow N. via a channel (now the Nelson R.) to Hudson Bay. Lake of the Woods and lakes Winnipeg, Winnipegosis, and Manitoba remain as remnants of Lake Agassiz. Most of the former lake bed is now a fertile plain where much grain is produced.

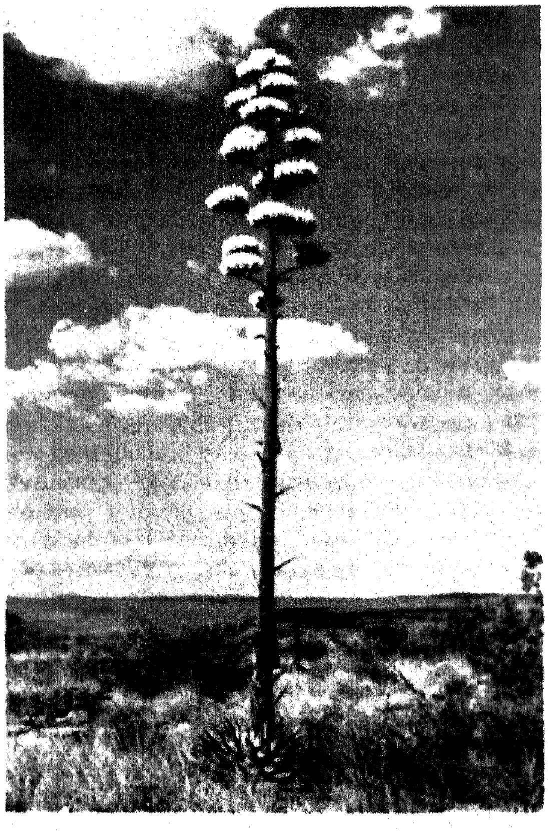
AGATE, mineral composed of layers of quartz (q.v.), generally of different colors. It usually occurs as rounded nodules or veins in traprock; the layers are often concentric. The composition of agate varies greatly, but silica is always predominant, usually with alumina and oxide of iron. Chalcedony, carnelian, amethyst, common quartz, jasper, opal, and flint occur as layers in agate. Among other forms of agate are star agate, clouded agate, with nebulous inclusions, and moss agate, with dark-colored dendritic inclusions. Agate can be polished to a high gloss, and is much used for ornamental purposes. Compare ONYX; see also separate articles on many minerals mentioned.

AGATE FOSSIL BEDS NATIONAL MONUMENT, site of a rich deposit of fossil skeletons of extinct mammals in N.W. Nebraska. The monument is in low-lying hills above the course of the Niobrara R. near the border with Wyoming. The mammals lived in the Miocene Epoch (q.v.), Age of Mammals, some 13 to 25 million years ago. Among the fossil remains are a two-horned rhinoceros (*Diceratherium*), a Terrible Pig (*Dinohyus*), and a tiny deerlike creature (*Stenomylus*). The name agate refers to nearby rock formations; the fossils themselves are imbedded principally in sandstone, on Carnegie and University hills. The monument, of approximately 3000 acres, was established in 1965.

AGATHA, Saint (fl. 3rd cent.), according to tradition, a noble Sicilian virgin of great beauty and wealth, who rejected the love of a Roman consul and as a result suffered a cruel martyrdom. She holds a high rank among the saints of the Roman Catholic Church. Whether Agatha ever lived, and, if so, whether she died in the persecution of Christians conducted during the reign of the Roman emperor Decius (201–51) or that of Diocletian (q.v.), fifty years later, is unknown. She is the patron saint of Malta and of Catania, Italy. Legend relates that several times the mere carrying of her veil (taken from her tomb in Catania) in procession averted eruptions of nearby Mt. Etna, and that her intercession saved Malta from Turkish conquest in 1551. Her feast day is Feb. 5.

AGATHOCLES (361–289 B.C.), tyrant of Syracuse, a Greek city in Sicily, born in Thermae Himerenses (now Termini Imerese), Sicily. After being exiled twice for attempting to overthrow the aristocratic government, he succeeded in 317 B.C. in his third attempt and became tyrant of all of Sicily. Agathocles continued the policy of previous Syracusan rulers of constantly warring with the Carthaginians; he threatened the city of Carthage itself in 310 B.C. His rule appears to have been popular and enlightened. Agathocles assumed the title of king in 304 B.C. Later he formed an alliance with Ptolemy I (*see under* PTOLEMY), ruler of Egypt. He raided Italy and in 299 B.C. conquered the island of Corcyra (now Kerkira) in the Adriatic Sea. In his will Agathocles provided for the restoration of the government to the people of Syracuse.

AGAVE, genus of plants of the Amaryllis family (Amaryllidaceae), native tó warm, dry regions of the Western Hemisphere. The best-known species is *A. americana,* the American aloe or century plant, so called because according to legend it flowers only once a century. Actually the plant usually flowers only once, between the ages of ten and twenty-five years. Shortly before it flowers, a long stalk grows rapidly upward to a height as great as 40 ft. The flowers are large and greenish and cover short, horizontal branches that spring from the upper half of the stalk. Some plants die after flowering, but their roots often develop into new plants. The plant may also be grown from seeds, bulbs, or underground stems. Its leaves are large, thick, and fleshy, and can store considerable quantities of water. They are spiked, particularly at the tips, are evergreen, and grow to a length of about 6 ft. in a cluster around the base of the plant. The century plant grows wild in the desert regions of the United States and Mexico, and is often planted in sandy soil in gardens in the southern U.S.



Century plant, Agave americana, *in the Prescott National Forest, Arizona.* U.S. Forest Service

Many species of agave are of economic importance. *A. sisalana,* native to the West Indies, but now also grown in Mexico and various tropical countries of the Old World, yields sisal or sisal hemp. Fibers about 3 to 5 ft. long are obtained from the leaves of this plant. Other species of agave yield similar fibers that are called sisal, or, more properly, false sisal. The roots of some species yield a pulp that produces a lather when wet and is used as soap. Such soap plants are called amoles. The sap of some agaves is fermented to obtain a drink called pulque, which can be distilled to make a colorless liquor, mescal. All agave is called maguey in Mexico. One species of agave, *A. virginica,* the false aloe, is native to the southeastern U.S.

See ALOE; HENEQUEN.

AGE, in archeology, *see* ARCHEOLOGY: *Periods;* in geology, *see* GEOLOGY, HISTORICAL.

AGE, in law, that period in the life of a human being when he is considered fully capable of exercising the rights and fulfilling the duties of ordinary citizenship. In the United States and Great Britain, full age is generally attained on the day preceding the twenty-first birthday. A person below the age of twenty-one is legally considered an infant or minor. A boy at fourteen and a girl at twelve are capable of matrimonial consent under common law, but State statutes differ on the age of consent. The age, *however, at which a female is held* capable of consenting to illicit carnal intercourse has generally been raised in the U.S. to as high as eighteen. Persons under seven cannot be found guilty of crime; between the ages of seven and fourteen the legal presumption is that they are incapable of criminal intention, but this presumption may be rebutted by strong and clear proof to the contrary. In the U.S. no one can be a representative in Congress until he is twenty-five, a senator until thirty, or President until thirty-five. In Great Britain twenty-one is generally the age at which men are eligible for public offices, including membership in Parliament.

AGEE, James (1909–55), American writer, born in Knoxville, Tenn., and educated at Harvard University. A collection of his poetry, *Permit Me Voyage,* was published in 1934. His study of the life of sharecroppers, *Let Us Now Praise Famous Men,* appeared in 1941, illustrated by the American photographer Walker Evans (1903–75). Agee's fiction was limited to two works, the novelette *The Morning Watch* (1954) and the delicate and moving novel *A Death in the Family* (1957). For the latter Agee was posthumously awarded the 1958 Pulitzer Prize in fiction. The novel was successfully dramatized as a play (1960) and as a film (1963), both appeared under the title *All the Way Home.* Agee also wrote several screenplays—*The Quiet One* (1948), *The African Queen* (1952), "The Bride Comes to Yellow Sky" episode of *Face to Face* (1952), and *Night of the Hunter* (1955). His film criticism, written for *Time, Life,* the *Nation,* and other periodicals, was published in *Agee on Film* (2 vol., 1958–60). *Letters of James Agee to Father Flye* (1962) contains Agee's letters to an Episcopal priest and reveals the complexity and anguish of the author, who achieved fame only after his death.

James Agee Helen Levitt

AGEN (anc. *Aginnum*), town in France, and capital of the department of Lot-et-Garonne, on the Garonne R., about 75 miles S.E. of Bordeaux. It is an important trading center for the region between Bordeaux and Toulouse, dealing in such commodities as cattle, poultry, and fruits, especially the dried plums (*pruneaux d'Agen*) processed in the town. Agen was originally the capital of the Nitiobroges, a Gallic tribe. Later it was made the capital of the province of Agenais. Agen became the seat of a new bishopric in the 4th century; the cathedral was begun in the 12th century. Pop. (1968) 34,705.

AGENCY. *See* PRINCIPAL AND AGENT.

AGENCY FOR INTERNATIONAL DEVELOPMENT, known as A.I.D., agency of the Department of State responsible for carrying out nonmilitary, United States foreign-assistance programs. It was created in 1961 to combine economic and technical assistance operations of the International Cooperation Administration, the loan activities of the Development Loan Fund, and the local currency-lending functions of the Export-Import Bank of the United States (q.v.).

The Agency for International Development has four regional bureaus: Far East, Near East and South Asia, Africa, and Latin America. The assistant secretary who heads A.I.D. is also coordinator for the Alliance for Progress (q.v.). On an equal administrative level is the Office of the War on Hunger, created in 1967, which coordinates food grants to countries unable to produce enough food for their citizens.

The A.I.D. programs are directed to some seventy developing countries. Much of the aid involves contributing U.S. goods and services for specific activities, rather than granting money outright. The agency provides aid in the form of financial loans to help develop specific social and economic projects and general importation programs to foster economic growth and technical assistance and training. It also provides funds to assist nations during times of political emergency.

AGE OF REASON, THE. *See* PAINE, THOMAS.

AGERATUM, tropical American genus of flowering annual herbs in the Composite family (Compositae), or any plant of the genus. The ageratum is known also as the flossflower. The genus comprises about thirty species, of which the best known is *A. houstonianum,* a species native to Mexico and widely cultivated in gardens and greenhouses. This ageratum is an attractive, low-growing plant, averaging about 1½ ft. in height, with opposite, hairy leaves that are usually heart-shaped. Its flowers are generally blue and are borne in clusters of delicate, tassel-like heads. It blooms throughout the summer and is often used for garden borders.

AGESILAUS II (about 444–360 B.C.), King of Sparta (about 400–360 B.C.), son of King Archidamus II (*see under* ARCHIDAMUS), and the successor of his half brother, King Agis II (r. about 426–399 B.C.). After Agesilaus became king, he took command of the forces in Asia Minor that were defending the Greek cities from the Persians. He won several battles but was recalled to defend Sparta against a hostile alliance of Athens, Thebes, Argos, and Corinth. Agesilaus was victorious against the alliance at the battle of Coronea, in Boeotia, in 394 B.C. He continued to lead his state in wars against other Greek states, especially Thebes. Despite the defeat of the Spartans at Leuctra in 371 B.C., where Cleombrotus I (r. 380–371 B.C.), coruler of Sparta, was in command, Agesilaus continued to make war. He died on his way home from leading a mercenary expedition in Egypt against the Persians.

AGGADA. *See* HAGGADA.

AGINCOURT, BATTLE OF, military engagement fought in France during the Hundred Years' War (q.v.), on Oct. 25, 1415, between an army under Henry V (q.v.), King of England, and a French army under Charles d'Albret (d. 1415), constable of France. Prior to the action, which took place in a narrow valley near the village of Agincourt (now Azincourt, in Pas-de-Calais Department), Henry, a claimant to the French throne, had invaded France and seized the port of Hárfleur. At the time of the action Henry's army, weakened by disease and hunger, was enroute to Calais, from which Henry planned to embark for England. In the course of the march to Calais the English force, which numbered about 6000 men, for the most part lightly equipped archers, was intercepted by D'Albret, whose army of about 25,000 men consisted chiefly of armored cavalry and infantry contingents. The English king, fearful of annihilation, sought a truce with the French, but his terms were rejected. In the battle, which was preceded by heavy rains, the French troops were at a disadvantage because of their weighty armor, the narrowness of the battleground, the muddy terrain, and the faulty tactics of their superiors, notably in using massed formations against a mobile enemy. The French cavalry, which occupied frontal positions, quickly became mired in the mud, making easy targets for the English archers. After routing the enemy cavalry, the English troops, wielding hatchets, billhooks (a type of knife), and swords, launched successive assaults on the French infantry. Demoralized by the fate of their cavalry and severely hampered by the mud, the French foot soldiers were completely overwhelmed. D'Albret, several dukes and counts, and about 5000 other members of the French nobility were killed; other French casualties totaled about 5000. English losses in the battle numbered less than 200 men. French feudal military strategy, traditionally based on the employment of heavily armored troops and cavalry, was completely discredited by Henry's victory. Although Henry returned to England after Agincourt, his triumph paved the way for English domination of most of France until the middle of the 15th century. S.R.Pa.

AGING. *See* GERONTOLOGY.

AGNES, Saint (d. 304?), virgin martyr and patron saint of young girls, venerated since the 4th century A.D. She is included in all martyrologies, both Eastern and Western. Although the many legends about Saint Agnes disagree on the manner and date of her death, they all agree on her extreme youth. Some accounts claim that she was twelve, others thirteen, years of age when she was executed. According to one of the most popular legends, Agnes was a beautiful Roman maid born into the Christian faith. A Roman prefect wished to arrange a marriage between Agnes and his son, and when she refused he denounced her as a Christian. To dishonor her he sent her to a public brothel, where the one man who ventured to touch her was stricken with blindness; his sight was restored, however, in answer to her prayers. Shortly thereafter Agnes was tied to the stake, but since the fagots would not burn, she was decapitated.

Her symbol is the lamb. On Jan. 21, her traditional feast day, two lambs are blessed after a pontifical high Mass. Their wool is then woven into palliums (bands of white wool), which the pope confers on archbishops as a token of their jurisdiction. On St. Agnes' Eve young girls traditionally try to determine the identity of their future husbands by various superstitious means. The superstition associated with her cult is the subject of a poem "The Eve of St. Agnes" by the British poet John Keats (q.v.).

AGNEW, Spiro Theodore (1918–), thirty-ninth Vice-President of the United States, born in Baltimore, Md. The son of a Greek-born father and an American mother, his family name originally was Anagnostopoulos. Agnew attended Johns Hopkins University from 1939 to 1942, leaving to join the United States Army during World War II. After the war he studied at the law school of the University of Baltimore, receiving an LL.B. degree in 1947. During the period from 1947 to 1962 Agnew practiced law in the Baltimore area.

Agnew, a member of the Republican Party, won his first political office in 1962, when he was elected Baltimore County Executive. Four years later he won the Maryland governorship In 1968 and again in 1972 Agnew was elected Vice-President under Richard Milhous Nixon (q v) As Vice-President he was a member of the National Security Council (q v), the National Aeronautics and Space Council, and the Urban Affairs Council

Resignation. In August, 1973, Agnew acknowledged that he was under investigation by the office of the United States attorney in Baltimore But he denied all charges, which included bribery, extortion, tax fraud, and conspiracy He requested a Congressional investigation of the charges, but his request was tabled Late in September, when a Federal grand jury in Baltimore began hearing evidence against the Vice-President, a dramatic series of legal actions and public statements ensued. On Oct 10, the attorney general of the U.S., Elliot L(ee) Richardson, entered charges in the Baltimore court that Agnew had asked for and accepted cash payments totaling more than $100,000 while holding office as county executive, governor, and Vice-President Agnew thereupon pleaded nolo contendere (no contest) to a single charge of Federal income tax evasion in 1967; he denied all other charges. Agnew was fined $10,000 and sentenced to three years of unsupervised probation. Immediately before this courtroom action he had resigned, becoming the first Vice-President of the U S. to give up his office because of criminal charges.

In May, 1974, Agnew was barred from the practice of law by the Maryland State Court of Appeals. He had meanwhile become a consultant in international trade

AGNON, Shmuel Yosef Halevi, original surname CZACZKES (1888–1970), Israeli writer, born in Buczacz, Galicia, then part of the Austro-Hungarian Empire. Educated at home and at the local Hebrew school, he published his first poetry, written in both Hebrew and his native Yiddish, at the age of fifteen. In 1908 he emigrated to Palestine, settling in Jerusalem in 1910. Except for two stays in Germany, from 1912 to 1924 and from 1930 to 1932, Agnon lived in Israel until his death. In 1935 he was named the first recipient of the Bialik Prize in Hebrew literature, regarded as the most prestigious literary prize in Israel. In 1966, Agnon and the German-Swedish writer Nelly Sachs (q.v.) shared the Nobel Prize in literature Agnon was cited for his "profoundly characteristic narrative art with motifs from the life of the Jewish people".

Unlike other authors writing in Hebrew or Yiddish who attempt to fit their stories into the mainstreams of European culture, Agnon expressed in his writings the 18th-century traditions of Galician Jews. His stories, written in a simple but allusive style and deeply religious in feeling, are rich in Jewish folk legends and mysticism They note the gradual decline of the Galician Jewish communities between the time of his youth and the beginning of World War I In the same way, the stories of Agnon that are set in Palestine and Israel illustrate the differing outlooks of the religious and idealistic early Jewish settlers of Palestine and the largely secular present-day Israelis Among his most admired works are his novels *Ha-Khnassat Kallah* (1931; Eng. trans., *The Bridal Canopy,* 1937) and *Oreah Nata la-Lun* (1937, Eng trans , *A Guest for the Night*, 1968), and the collected work *Twenty-one Stories* (1970)

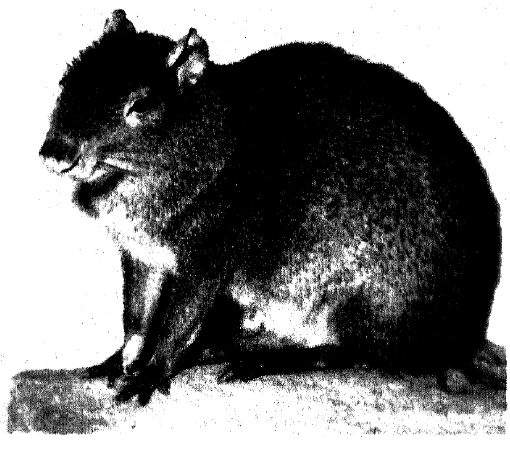
AGNOSTICISM, doctrine that the existence of God and other spiritual beings is neither certain nor impossible The term, derived from the Greek *agnostikos* ("not knowing"), was introduced into English in the 19th century by the British biologist Thomas Henry Huxley (*see under* HUXLEY). The agnostic position is distinct from both theism (q.v), which affirms the existence of such beings, and atheism (q v), which denies their existence

Although usually regarded as a form of skepticism (q v.), agnosticism is more limited in scope, for it denies the reliability only of metaphysical and theological beliefs rather than of all beliefs The basis of modern agnosticism lies in the works of the British philosopher David Hume and the German philosopher Immanuel Kant (qq.v.), both of whom pointed out logical fallacies in the traditional arguments for the existence of God and of the soul. Another school of modern philosophy which, like agnosticism, rejects both atheism and theism, is empiricism (q.v.), also known as logical positivism, which maintains that metaphysical statements are meaningless R.A

AGORA, in ancient Greece, the public square or marketplace of a city, used as the site of popular assembly. Large and open, the agora was regarded as the center of political, commercial, religious, and social activities in the city It was surrounded by the public buildings and temples. The most famous is the Athenian agora, located northwest of the Acropolis (q v.)

AGOULT, Marie Catherine Sophie de Flavigny, Comtesse d', pen name DANIEL STERN (1805–76), French writer, born in Frankfurt-am-Main, West Germany. She married the Comte d'Agoult in 1827, but left him to live with the Hungarian composer Franz Liszt (q.v.), to whom she bore three daughters. One of the daughters, Cosima (1837–1930), married successively the German conductor Hans von Bülow and the German composer Richard Wagner (qq.v.). Among the works of the Comtesse d'Agoult are the semiautobiographical romance *Nélida* (1845), *Lettres Républicaines* ("Republican Letters", 1848), *Histoire de la Révolution de 1848* ("Story of the Revolution of 1848", 1851–53), and *Mes Souvenirs, 1806–33* ("My Memories, 1806–33", 1877). Her *Esquisses Morales et Politiques* ("Ethical and Political Sketches", 1849) is considered her best work.

AGOUTI, common name for rodents of the genera *Dasyprocta* and *Myoprocta*, constituting the family Dasyproctidae. The agouti is found in forested regions from southern Mexico south to Paraguay, and in the West Indies. It is short eared, has practically no tail, and has a soft coat of golden-brown or reddish hair, sometimes speckled. The agouti is approximately the size of a rabbit. At first glance the agouti resembles the guinea pig, but it has slender, comparatively long legs and can run swiftly. The agouti lives in an underground den, from which it emerges usually at night. It feeds on green leaves, roots, and fallen fruit. Esteemed for its flesh and hated in farming areas because of its destructiveness, the agouti is hunted and killed in great numbers. The agouti reproduces rapidly, however; the female usually has two litters of two to four young each year. Born open-eyed and fully furred, the young agouti is ready to look after itself immediately.



Golden agouti, Dasyprocta aguti
Arthur W. Ambler – National Audubon Society

AGRA, city of the Republic of India, in Uttar Pradesh State, and capital of Agra District, on the Jumna R., 110 miles S.E. of Delhi. The city is a railroad junction and a commercial and industrial center for the surrounding agricultural area. Agra has an extensive trade in cotton, grain, tobacco, salt, and sugar. Factories are engaged in food processing and in the production of cotton textiles, carpets, iron and steel, and leather goods. Educational institutions include the University of Agra, a medical college, a teachers college for men, and a teachers college for women. Agra is celebrated as the site of the Taj Mahal (q.v.) and of several other outstanding examples of Indo-Saracenic architecture, including the Jahangri Mahal, a palace of white marble constructed for the Mogul emperor Akbar (q.v.), and the Moti Masjid or Pearl Mosque, built during the early 17th century.

Although Agra was the capital of some of the pre-Mogul dynasties of Indian rulers, the city did not attain prominence until after it was captured in 1526 by Baber (q.v.), the first of the Muslim emperors. From that time until 1658, when the Mogul emperor Aurangzeb (q.v.) moved to Delhi, the city was the Mogul seat of government; see INDIA: *History*. The British captured Agra in 1803, and since 1835 the city has been a provincial capital and administrative center. Pop. (1971) 594,858.

AGRAPHA OF JESUS, sayings attributed to Jesus that are not contained in the Gospels. These are preserved in the Acts of the Apostles (Acts 20:35) in the New Testament, the Apocryphal New Testament, the Apostolic Canons, Gnostic literature, the Talmud (q.v.), and Muslim sources. In 1897 and 1903 valuable papyri containing such sayings were discovered at Oxyrhyncus, in what is now the Arab Republic of Egypt. A book of such sayings of Jesus was, in early traditions, attributed to Saint Matthew (q.v.), one of the twelve Apostles.

AGREEMENT OF THE PEOPLE. See LEVELLERS.

AGRICOLA, Georgius, real name GEORG BAUER (1494–1555), German scientist, born in Saxony, and educated in medicine in Italy. He became the town physician in the mining center of Joachimsthal in 1527, but he made the study of mineralogy and geology his lifework. Agricola is generally regarded as the founder of the science of mineralogy. His greatest work, *De Re Metallica* ("About Metallic Things", 1556), which appeared after his death, served as a textbook and guide for miners for almost two centuries. At the time of his death Agricola was burgomaster of the city of Chemnitz (now Karl-Marx Stadt).

AGRICOLA, Gnaeus Julius (37–93 A.D.), Roman statesman and general, born in Forum Julii (now Fréjus in Var Department, France), and educated in philosophy in Massilia (now Marseille) He served with distinction in the Roman provinces of Britain, Asia, and Aquitania and held numerous civil offices at Rome, ending with the consulship in 77 The following year he was appointed governor of the Roman province of Britannia During the seven years of his administration there he attempted to subdue the native peoples, winning victories over the Ordovices in Wales and over the Caledonians in Scotland After defeating the Caledonians his fleet circumnavigated the coast of Scotland, proving Britain to be an island His success, however, aroused the jealousy of the Roman emperor Domitian (q v), who recalled him to Rome and was perhaps responsible for Agricola's death Agricola was the father-in-law of the Roman historian Cornelius Tacitus (q v), whose work *Agricola* is a laudatory biography of the general.

AGRICULTURAL ADJUSTMENT ACT. *See* AGRICULTURE *Agriculture in the United States: Price-Support Measures*, NEW DEAL

AGRICULTURAL CHEMISTRY, branch of chemical science that deals with the nutrition of plants and farm animals, and with the production of food for human consumption at the least possible cost in money, labor, and natural resources Agricultural chemistry is also sometimes concerned with use of agricultural products in the manufacture of substances valuable for purposes other than food, but these nonfood purposes are more properly a branch of the science of chemurgy (q.v.).

With the exception of water and air, plants draw all of their food constituents from properly fertilized soil, *see* FERTILIZER Soil analysis and fertilizer analysis are therefore important fields of agricultural chemistry. The principal substances needed by plants are nitrogen, potassium, and phosphorus, and these elements make up the bulk of most fertilizers. Fertilizers may consist of the wastes and by-products from meat-packing houses and related trades, or may be mixtures of synthetic chemicals. The principal nitrogen-containing substances employed in the manufacture of modern fertilizers are ammonia and its solutions, ammonium nitrate, ammonium phosphate, ammonium sulfate, calcium cyanamide, sodium nitrate, manures, urea, and activated sludge from sewage. The principal phosphorus-containing ingredients include ammonium phosphate, ordinary superphosphate, and triple superphosphate. Potassium-containing ingredients include manure salts, potassium chloride, and sulfate of potash. Sulfur and calcium (lime) must also sometimes be added to fertilizers Other elements, notably magnesium, iron, and aluminum, may be needed in small quantities, but are invariably present in the soil Recently it has been discovered that certain other substances are needed in extremely minute quantities, and that their absence causes severe deficiency diseases of plants The most important of these so-called trace elements (q.v.) is boron; other essential trace elements are copper, manganese, zinc, and molybdenum The mineral needs of plants have now been so thoroughly ascertained that it is possible to grow plants of good quality in water instead of soil if they are fed with a solution of the correct mineral substances, in proper proportions and at a proper rate; *see* HYDROPONICS. The acidity (pH) of the soil or other medium has an important influence on the ability of the plant to assimilate nutrients.

An agricultural chemist examines the effects of differing amounts of fertilizer on similar plants UPI

The analysis of foods is an important activity of the agricultural chemist. In most cases he determines the amounts of protein, carbohydrates, fat, minerals, and vitamins present, since these are the important substances from the viewpoint of the nutritionist. Sometimes he must determine the presence of adulterants or of contaminants produced by insecticides and other chemicals employed during the growing season.

The discovery, preparation, and use of various pest killers which save millions of dollars' worth of agricultural products annually, lie in the province of the agricultural chemist. In recent years numerous highly efficient chemicals for this purpose have been developed. Among the best known are the insecticides (see INSECTICIDE) arsenious oxide, calcium arsenate, lead arsenate, pyrethrum, rotenone, parathion, DDT (q.v.), paradichlorbenzene, and 666 ($C_6H_6Cl_6$, benzene hexachloride, also known as lindane); weed killers such as sodium arsenite, borax, calcium cyanamide, sodium chloride, and 2,4–D (see WEEDS); rodenticides such as ANTU (alpha naphthyl thiourea) and 1080 (sodium fluoroacetate); and fungicides such as lime sulfur, Bordeaux mixture, Spergon and Puratized N_5; see FUNGICIDE.

In view of the increasing evidence of the adverse effect on wildlife and of contamination of the environment, strong doubts have been expressed by conservationists and some scientists about the use of long-lasting pesticides such as DDT, dieldrin, and heptachlor.

Chemicals that promote the growth of plants and animals were discovered in the 1950's, and many were synthesized in the 1960's. Plant-growth regulators, known as auxins, are generally organic acids with an unsaturated cyclic nucleus, or compounds derived from these acids. An example is 2,4–D (2,4–dichlorophenoxyacetic acid); in low concentrations this compound stimulates the growth of broad-leafed plants, but at high concentrations it so drastically alters the physiologic processes of the plant that it is highly toxic. The compound does not affect narrow-leafed or monocotyledonous plants, such as grasses and cereals; therefore it kills weeds without harming economically useful plants.

In that the substances with which agricultural chemistry deals are products of living organisms, or agents to destroy or accelerate the growth of such organisms, the subject is really an applied form of biochemistry (q.v.). Thus, the agricultural chemist is an agriculturist when he is in the field, and a physiological chemist when he is in the laboratory. *See* AGRICULTURE. For the uses of antibiotics in agriculture, *see* ANTIBIOTIC. For the use of radioactive isotopes in agricultural research, *see* TRACERS. S.Z.L.

AGRICULTURAL EDUCATION, education designed to teach the best agricultural techniques so that land, pastures, and other agricultural resources may be utilized for maximum profit. The high agricultural productivity in the United States stems in large measure from educational facilities available to farmers. Such facilities include agricultural colleges, experiment stations, the agricultural extension system, and organized youth activities.

The first agricultural schools were established during the 1850's in Michigan and Pennsylvania. Practical apprenticeship and self-training, however, were still the chief means by which farmers learned the techniques of farming. The first significant advance in agricultural education began in 1862 when President Abraham Lincoln (q.v.) signed the Morrill Act, which enabled the States to establish land-grant colleges (q.v.). Under this measure each State received a grant of public lands to be used or sold to provide a college to teach the agricultural and mechanical arts. By the following year each State had established such a college.

To supplement the instructions given in agricultural colleges, Congress passed in 1887 the Hatch Act, establishing the system of the agricultural experiment station (q.v.). By 1893, 49 such stations were in existence. Today more than 50 stations are in operation. With fields, barns, greenhouses, and laboratories at their disposal, scientists at these stations are enabled to study soils, crops, animals, weed diseases, and pests.

Complaints arose, however, that much of the new information was not reaching farmers. To meet this complaint the Agricultural Extension Service, which was later called the Federal Extension Service (q.v.), was established in 1914. With money from State, county, and sometimes private sources, it became possible for each county to maintain a resident, college-trained expert, called usually the county agricultural agent, but also called farmer adviser or extension agent. The extension service spread rapidly until nearly every rural county had an agricultural agent.

Even before the county-agent system appeared, it was recognized that farm children needed to be taught improved farming techniques. From this early recognition the nationwide Four-H (4-H) Clubs (q.v.) grew.

The Smith-Hughes Act of 1917 provided Federal funds for vocational education, including instruction in farming. About 1928 the Future Farmers of America was organized. The activities of this organization differ somewhat from those of the Four-H Clubs, although the basic objectives are similar. More than 1,500,000 boys and girls participate each year in Four-H Clubs and some 400,000 boys belong to the Future Farmers of America.

Along with the agricultural colleges, Federal Extension Service programs, and youth organizations, the American farmer is also informed on farming techniques and management through the many farm journals, bulletins, farmers' clubs, and discussion groups. In addition, some radio and television stations have special programs to bring timely agricultural and marketing news to the farm population.

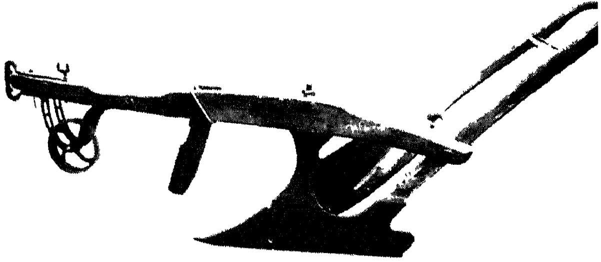
AGRICULTURAL EXPERIMENT STATION, an agency for agricultural research established in each State of the United States and in Puerto Rico. Under the terms of the Hatch Act (1887), stations are financed by State funds and Federal grants. Each station concentrates primarily on the agricultural problems of its area, engaging in research and experimentation to widen the scope of college courses and farm advisory services. Research projects are coordinated through the Cooperative State Research Service of the United States Department of Agriculture (see AGRICULTURE, DEPARTMENT OF).

AGRICULTURAL EXTENSION SERVICE. *See* FEDERAL EXTENSION SERVICE.

AGRICULTURAL MACHINERY, devices used to perform operations necessary for the growing of crops. Since prehistoric times, when cultivation of plants was first undertaken by primitive farmers, man has found the use of implements necessary. Primitive implements were pointed objects used for digging and keeping soil loosened, and sharp, knifelike objects used for cutting ripened crops. Modifications of these early implements led to the development of small hand tools still used in small scale gardening, such as the spade, hoe, rake, trowel, and scythe, and larger implements, such as plows, larger rakes, and hoes, that are drawn by humans, animals, or simple machines. *See* AGRICULTURE: *History*.

A large proportion of the arable land of the earth is still tilled by primitive peoples or by farmers operating under conditions that do not permit use of expensive modern machinery. Use of such implements has developed extensively in the United States, Canada, Great Britain, western Europe, the Soviet Union, and Australia.

Modern large agricultural implements, adapted to large-scale farming methods, are usually operated by motor-driven prime movers. The principal prime mover of modern agriculture is the tractor (q.v.), which provides locomotion for other implements and can furnish power for operation of machines drawn behind the tractor in the field. The power shafts of tractors may also be harnessed to belts for operating such equipment as feed grinders, pumps, or electric-power generators. Small implements, such as portable irrigators, often are powered by individual motors.



The Eagle plow, used in Massachusetts throughout much of the 19th century. Made of cast iron, the plows worked well in the gravelly soil of New England.

Smithsonian Institution

Implements for Growing Crops. Many types of implements have been developed for breaking ground, planting, tilling, weeding, fertilizing, and combating pests.

Ground is broken by plows to prepare the seedbed. A plow consists of a bladelike plowshare that cuts under the soil, and a curved moldboard, against which the soil is lifted, turned, and pulverized. Modern tractor plows are equipped usually with two or more plowshares, so that a wide area of ground may be broken at a single sweep. Harrows are used to smooth plowed land and sometimes to cover seeds and fertilizers. The disk harrow, which has curved, sharp-edged steel disks, is used mainly to cut up crop residues before plowing and to uproot weeds after sowing. A roller is used to break up clods of soil to improve the aeration and water-hold capacity of the soil.

Planting of some cereal crops is still accomplished by broadcasting seed. Machines for broadcasting usually consist of a long seedbox mounted on wheels and equipped with an agitator to disperse the seed. Broadcast seeds are not always covered by a uniform or sufficient depth of soil, and so seeding is more often done with drills, which produce continuous furrows of uniform depth as seedbeds. The rate of sowing is adjustable in modern drills, but specialized implements called planters are necessary for sowing crops such as corn, which are planted in rows. Corn planters and other similar machines have a special feed wheel that picks up separate kernels or small quantities of grain and places them in the ground.

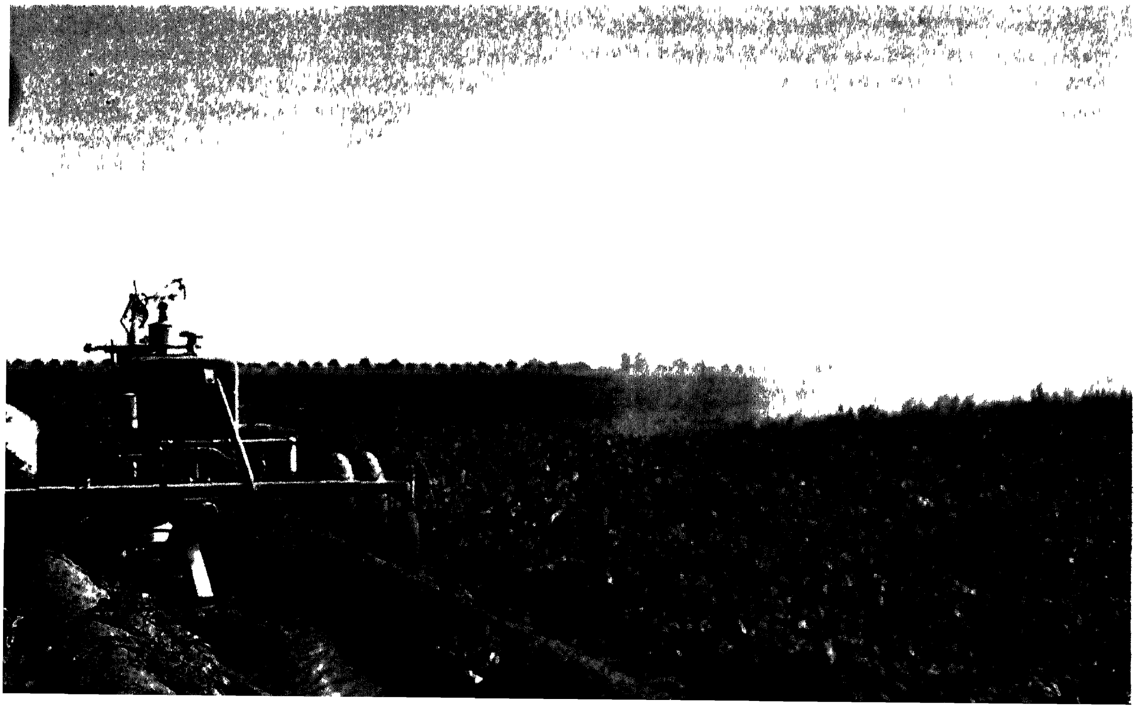
Fertilizer may be distributed during the winter or shortly before seeding time, but commercial fertilizers commonly are distributed, along with seeds, by drills and planters. Manure and other consolidated fertilizers are distributed most efficiently by a manure spreader, which is a wagon equipped with a bottom conveyor to

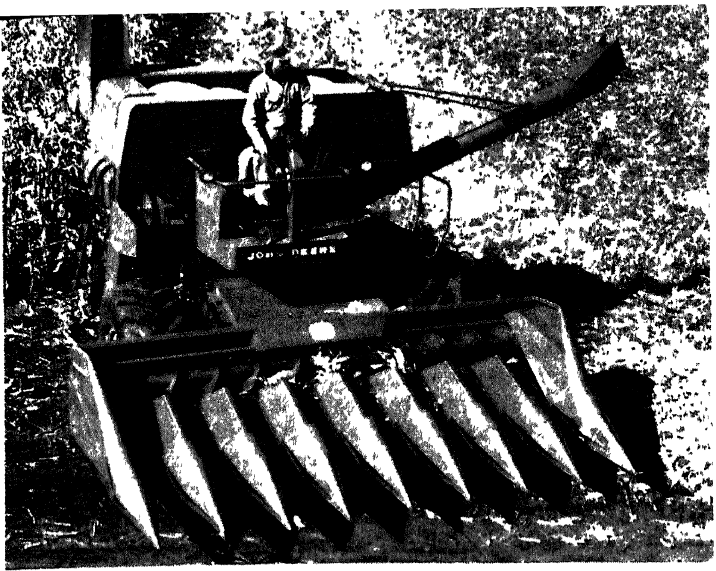
The self-propelled, two-row cotton picker allows the user to match harvesting speed to crop and field conditions

International Harvester Co

Below. The robot irrigator used to irrigate sugar beets in California employs a rotating gun, a precision instrument that assures even application of water.

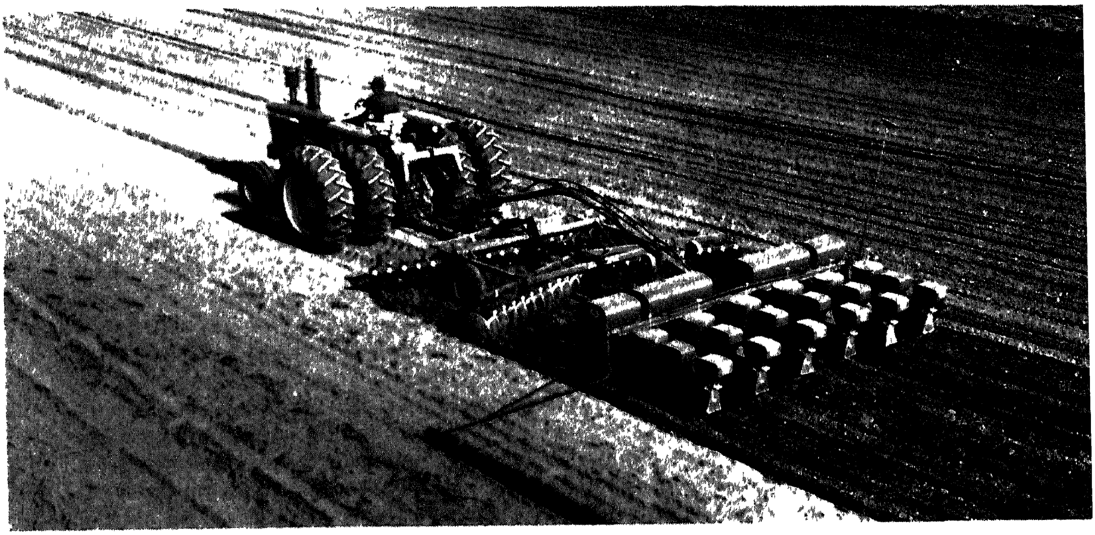
U.S Bureau of Reclamation



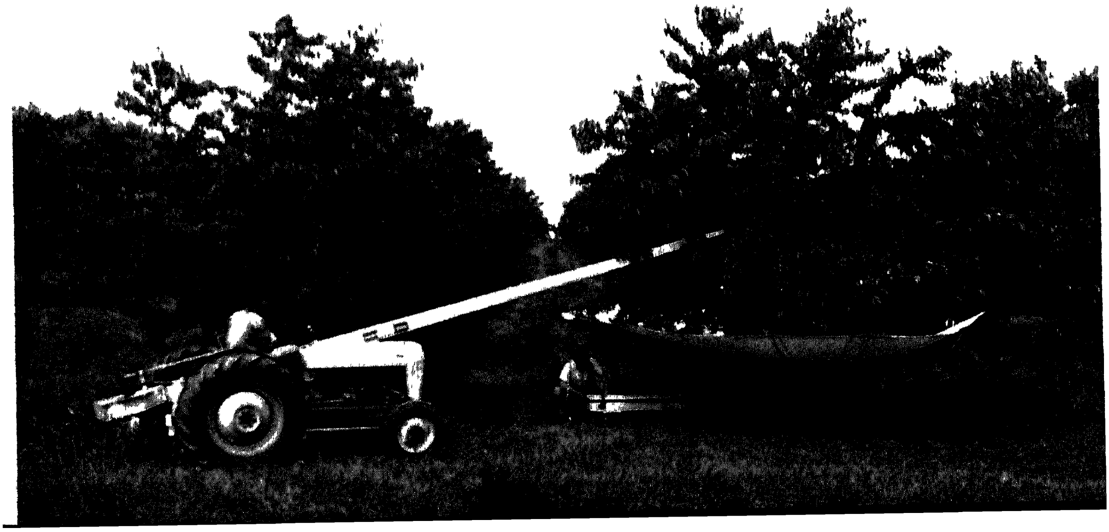


U S Dept of Agriculture

Left A combine picks corn from the stalk, removes the grain from the cob, and delivers the grain to a storage tank Below A tillage unit, attached to a tractor, performs five operations in one sweep of the field A disc prepares the soil for seed, the soil is fertilized and planted, and finally insecticide and herbicide are applied Bottom A tractor-mounted boom shaker removes cherries from trees The device lessens the need for pickers and reduces picking costs



Deere & Co



carry the fertilizer back to a beater attachment, which disintegrates and strews it on the ground.

After crops have begun to grow, a cultivator (q.v.) is used to destroy weeds (q.v.) and loosen and aerate the soil. A flame weeder, which produces a hot-air blast, can be used to destroy weeds in crops such as cotton, the stems of which have tough bark. Selective chemical herbicides applied in the form of a spray or as granules are used extensively for destruction of weeds. Insecticides also are applied to the soil and to crops in the form of granules, dust, or liquid sprays; see INSECTICIDE. A variety of mechanical spraying and dusting equipment is used to spread chemicals on crops and fields; the machinery may be self-powered or drawn and powered by a tractor. In areas where large crops of vegetables and grain are grown, airplanes are increasingly used to dust or spray insecticide. This method is important in locust control. Airplanes are also used in New Zealand to spread fertilizer on pastureland. *See* WEEDS.

Implements for Harvesting Crops. Machinery used for harvesting differs with the crop. Most cereal crops are harvested by means of a combine, which is a machine equipped to remove the fruiting heads, beat off the grain kernels, and clean the grain as the combine moves through the fields. The cleaned grain is accumulated in an attached grain tank.

Corn for grain is harvested by means of a corn picker or a grain combine with a corn-picker attachment. As the corn picker moves along the rows, the ears are picked from the stalks and are husked. The ears may be transferred from the husking bed in the picker either to a sheller, which removes the kernels from the ear, mounted on the picker or to a wagon trailing behind the machine. When a combine is utilized, the whole cornstalk may be put through the machine to shell the ears, or the attachment may simply snap the ears from the stalks and feed them to the combine for shelling. Recently developed corn combines are capable of picking, husking, and shelling up to 500 bu. of corn per hour.

Hay harvesting usually is a multiple operation because of the necessity of drying the hay after cutting it. Hay is first cut close to the ground with a mower. After drying, most hay is baled, although some is still put up as loose hay. In baling, the pickup baler lifts the hay to a conveyor that carries it to a baling chamber in which it is compressed into bales weighing up to 125 lb. and automatically tied with heavy twine or wire. The field chopper chops standing green hay and field-cured hay from windrows for silage. This machine can be equipped also to chop row crops, such as corn and sorghum. In harvesting grass silage, the machine is provided with a cutter bar and a reel for direct cutting. Alfalfa and other legume hay is harvested in some areas with a hay-cuber. This machine cuts the plants close to the ground and, after field curing, chops them into a fine mash and compresses the mash into cubes that are more easily shipped and stored than are bales. The cubes are of a size that cattle can eat readily.

Specialized machinery is used to harvest large root crops, such as potatoes and sugar beets. Mechanical cotton pickers and strippers are used in harvesting almost 95 percent of American-grown cotton. Mechanical pickers are equipped with rotating spindles which twist the cotton fiber from the boll. Before picking, the leaves of the cotton plant are removed by means of a chemical defoliant spray. Light-boll, stormproof cotton is harvested by means of strippers that comb or brush the cotton from the plant and lift it into a trailed wagon. More efficient mechanical cotton pickers are being developed. *See also* COTTON GIN.

In recent years agricultural technology has developed a wide variety of fruit- and vegetable-harvesting machines. For example, with a mechanical fruit picker, deciduous-tree fruits, such as plums, cherries, and apricots, are literally shaken down. The machine, with arms attached to limbs of the tree, agitates the tree and causes the fruit to fall onto a raised catching frame that surrounds the tree. Nut crops may also be harvested in this manner. A wind machine capable of blowing the ripe fruit from an orange tree in two or three minutes has been used experimentally. Researchers at the California Agricultural Experiment Station in Davis are developing a lettuce harvester that measures the size and degree of firmness of each lettuce head, and cuts and packs only those that are ready for harvesting. Plant breeders of the United States Department of Agriculture and the University of California have developed a variety of tomato especially adapted for harvesting by machines. This new, hardy variety is oblong and has a tough skin that reduces bruising and permits rapid and efficient harvesting by specially designed machines. Further research is being carried on to develop other varieties of fruits and vegetables for easy machine harvesting.

Practical Significance. Use of agricultural machinery substantially reduces the amount of human labor necessary for raising crops. In the U.S., from 1921 to 1966, the average amount of labor required per acre to produce and harvest corn, hay, and cereal crops decreased an average of 75 percent because of increased use of farm machinery Such mechanization, together with improved varieties of plant crops, better agronomic practices, and more efficient food processing enables the approximately 6 percent of the U S population living on farms to produce enough to feed the nation.

AGRICULTURAL RESEARCH SERVICE, agency of the United States Department of Agriculture, created in 1953 to supplant the Agricultural Research Administration Besides conducting research into a wide range of problems relating to the production and use of agricultural commodities, it is responsible for the control and eradication of plant and animal diseases Headquarters for much of the research of the agency are located at the Agricultural Research Center, a 12,000-acre establishment at Beltsville, Md *See* AGRICULTURE, DEPARTMENT OF

AGRICULTURE, art, science, and industry of growing plants and animals beneficial to mankind. In a broad sense agriculture includes cultivation of the soil (*see* SOILS AND SOIL MANAGEMENT), growing and harvesting crops (*see* HORTICULTURE), livestock breeding and raising (see *Animal Husbandry,* below), dairying, and forestry (qq v.). The packing, processing, and marketing of agricultural products are closely related activities. Agriculture depends heavily on engineering, technology, and the biological and physical sciences. Irrigation, drainage, conservation (qq.v.), sanitation, and mechanization, each of which is important in successful farming, are some of the fields requiring the specialized knowledge of agricultural engineers. Plant breeding (q.v.) contributes immeasurably to farm productivity. Agricultural chemistry (q v.) deals with other vital farm problems, for example, the uses of fertilizer, insecticide (qq.v.), and fungicide (*see* FUNGI: *Fungicides*), composition of soils, analysis of agricultural products, and nutritional requirements of farm animals. Genetics (*see* HEREDITY) has placed livestock breeding on a scientific basis. Hydroponics (q.v.), a method of soilless gardening in which plants are grown in chemical nutrient solutions, may solve additional agricultural problems; *see also* ALGAE Science has also influenced the processing and distribution of agricultural products; methods of quick-freezing and dehydration have increased the markets for farm products; *see* FOOD PRESERVATION. Airplanes and helicopters are employed in agriculture for such purposes as seeding, transporting perishable products, fighting forest fires, and in spraying operations involved in insect and disease control. Radio and television disseminate vital weather reports and other information that is of concern to farmers

Mechanization, the outstanding characteristic of late 19th- and 20th-century agriculture, has eased much of the backbreaking toil of the farmer More significantly, mechanization has enormously increased farm efficiency and productivity *See* AGRICULTURAL MACHINERY

WORLD AGRICULTURE

The importance of agriculture can hardly be overstated More than 50 percent of the world's labor force is employed in agriculture The distribution in the early 1970's ranged from 75 percent of those employed in Africa to less than 5 percent in North America In Western Europe, the figure was about 17 percent, in Eastern Europe and the Soviet Union, about 32 percent, and in Asia, about 68 percent

Farm size varies widely from region to region For example, the average for Canadian farms is about 460 acres per farm, in the United States, about 375 acres The average size of a single landholding in the Philippines, however, may be somewhat less than 9 acres, and in Indonesia, a little less than 3 acres

Size also depends on the purpose of the farm. Commercial farming, or production for cash, is usually done on large holdings The latifundia of Latin America are large privately owned estates worked by tenant labor. Single-crop plantations produce tea, rubber, and cocoa Wheat farms are most efficient when they comprise some thousands of acres and can be worked by teams of men and machines. Australian sheep stations and other livestock farms must be large to provide grazing facilities for thousands of animals Collective farms owned and operated by state employees, as in the Soviet Union, or the agricultural plots of a Chinese commune (q.v.), or the cooperative farms held by Peruvian communities are other necessarily large units.

Individual subsistence farms or small-family mixed-farm operations are decreasing in number in developed countries but are still numerous in the developing countries of Africa and Asia.

Nomadic herdsmen range over large areas in sub-Saharan Africa, Afghanistan, and Lapland; and herding is a major part of agriculture in such areas as Mongolia

The conditions that determine what will be raised in an area include climate, water supply, and terrain. For more detailed information, *see* such articles as CLIMATE, ECOLOGY, WATER SUPPLY AND WATERWORKS

Over the centuries, men have discovered the food value of wild plants and animals and domesticated and bred many varieties of them. Those that are most important are cereals such as wheat, rice, barley, corn, and rye, sugarcane and sugar beets, meat animals such as sheep, cattle, goats, and pigs or swine, poultry (q.v.) such as chickens, ducks, and turkeys, and such products as milk, cheese, eggs, nuts, and oils. Fruits, vegetables, and olives are also major foods for people; feed grains for animals include soybeans, field corn, and sorghum. Separate articles on individual plants and animals contain further information; see *also* GRASSES, HAY, LEGUME, SILAGE.

Agricultural income is also derived from nonfood crops such as rubber, fiber plants, tobacco, and oilseeds used in synthetic chemical compounds, as well as fur (q.v.) and tree crops. *See also* TEXTILES: *Textile Fibers*.

Much of the foreign exchange earned by a country may be derived from a single commodity; for example, Ceylon depends upon tea, Denmark specializes in dairy products, Australia in wool, and New Zealand and Argentina in meat products.

The importance of an individual country as an exporter of agricultural products depends on many factors. Among them is the possibility that the country is too little developed industrially to produce much of anything else. Such exporters include Ghana, with cacao, and Burma, with rice. Or an exceptionally well-developed country may produce surpluses not needed by its own population; this has been true of the U.S., Canada, and some of the Western European countries.

Because nations depend on agriculture not only for food, but for national income and raw materials for industry as well, trade in agriculture is a constant international concern. It is regulated by international agreements such as the General Agreement on Tariffs and Trade and by trading areas such as the European Economic Community (qq.v.). The Food and Agriculture Organization of the United Nations (q.v.) directs much of its attention to such trade; *see also* FOOD.

The sections on *Agriculture* contained in individual continent and country articles cover regional and national agriculture in more detail. *See also* separate articles on States of Australia and the U.S. and provinces of Canada.

HISTORY

The history of agriculture may, for discussion purposes, be divided into four periods, of unequal length, differing in date according to region.

A figure of cast silver holds ears of corn and wears a costume of produce that had early cultivation in Latin America. Courtesy of the American Museum of Natural History

Prehistoric Agriculture. Early agriculturists were, it is agreed, largely of Neolithic (q.v.) culture. Sites occupied by such people are located in southwestern Asia, in what are now Iran, Iraq, Israel, Jordan, Syria, and Turkey, in southeastern Asia, in what is now Thailand, in Africa, along the Nile R. in Egypt, and in Europe, along the Danube R. and in Macedonia, Thrace (qq.v.), and Thessaly (see THESSALIA). Early centers of agriculture have also been identified in the Hwang Ho area of China, the Indus R. valley of India and Pakistan, and the Tehuacan Valley of Mexico, northwest of the Isthmus of Tehuantepec.

The dates of domesticated plants and animals vary with the regions, but most predate the 6th millennium B.C., and the earliest may go back as far as 10,000 B.C. Scientists have carried out carbon 14 testing of animal and plant remains and have dated finds of domesticated sheep at 7200 B.C. in Thessaly, cattle in the 6th millennium B.C. in northeastern Iran, goats at 8000 B.C. in central Iran, pigs at 8000 B.C. in Thailand and 7000 B.C. in Thessaly, onagers, or asses, at 7000 B.C. in Jarmo, Iraq, and horses at 4350 B.C. in the

Ukraine The llama and alpaca were domesticated in the Andean regions of South America by the middle of the 3rd millennium B C

According to carbon dating, wheat and barley were domesticated in the Near East in the 7th millennium B C, millet and rice in China and southeastern Asia by 3000 B C, and corn and beans in Mexico about 7000 B C Legumes found in Thessaly and Macedonia are dated as early as 6000 B C Flax was grown and apparently woven into textiles early in the Neolithic period

The farmer began, most probably, by noting which of the wild plants around him were edible or otherwise useful and learned to save the seed and to replant it in cleared land Long cultivation of the most prolific and hardiest plants yielded a stable strain. Herds of goats and sheep were assembled from captured young wild animals, and those with the most useful traits—such as small horns, high milk yield, etc —were bred. The aurochs seems to have been the ancestor of European cattle, an Asian wild ox, of the zebu (q.v), the humped cattle of Asia. The cat, dog, and chicken were domesticated very early. The transition from hunting and food gathering to a dependence upon food production was gradual, and in a few isolated parts of the world has not yet been accomplished. Crops and domestic meat supplies were augmented by fish and wildfowl as well as by meat of wild animals

The Neolithic farmers lived in simple dwellings—in caves and in small houses of sunbaked mud brick or of reed and wood These homes were grouped into small villages, or they might be single farmsteads surrounded by fields, sheltering animals and humans in adjacent or joined buildings; see HOUSE: *History.* Late in the Neolithic period, cities such as Jericho and Ur (qq.v.) were made possible by the production of agricultural surpluses.

Pastoralism may have been a later development. It would seem that mixed farming, combining cultivation of crops and stock raising, was the most common Neolithic pattern. Nomadic herdsmen, however, roamed the steppe lands of Europe and Asia, where the horse and camel were domesticated.

The earliest tools of the farmer were of wood and stone. They included the stone adz; the sickle or reaping knife with sharpened stone blades, used to gather grain; the digging stick, used to plant seeds, and, with later adaptations, as a spade or hoe; and a rudimentary plow, a modified tree branch used to scratch the surface of the soil and prepare it for planting. The plow was later adapted for pulling by oxen.

The hilly areas of southwestern Asia and the forests of Europe had enough rain to sustain agriculture, but Egypt depended upon the annual floods of the Nile to replenish soil moisture and fertility The inhabitants of the so-called Fertile Crescent, around the Tigris and Euphrates rivers, also depended upon annual floods to supply irrigation water Drainage was necessary to prevent the carrying off of land from the hillsides through which the rivers ran The Hwang Ho farmers developed a system of irrigation and drainage to control the damage caused to their fields in the flood plain of the meandering river

Although the Neolithic settlements were more permanent than the camps of hunting populations, villages had to be moved periodically in some areas, as the fields lost their fertility from continuous cropping This was most necessary in northern Europe, where fields were produced by the slash-and-burn method of clearing The settlements along the Nile, however, were more permanent, because the river deposited fertile silt annually.

See ARCHEOLOGY *Current Research The Agricultural Revolution,* ASSYRIA; BIBLE SCHOLARSHIP *Biblical Archeology,* PALESTINIAN ARCHEOLOGY *Cultural History*

Historical Agriculture through the Roman Period. With the close of the Neolithic period and the introduction of metals, the age of innovation in agriculture was largely over The historical period—known through written and pictured materials, including the Bible (q v), Near Eastern records and monuments, and Chinese, Greek, and Roman writers—was devoted to improvement A few high spots must serve to outline the development of worldwide agriculture in this era, roughly defined as 2500 B C to 500 A D For a similar period of development in Central and South America, somewhat later in date, *see* AMERICAN INDIANS

Some plants became newly prominent Grapes and wine were mentioned in Egyptian records about 2900 B C, and trade in olive oil and wine was widespread in the Mediterranean area in the 1st millennium B C Rye and oats were cultivated in northern Europe about 1000 B C

Many vegetables and fruits, including onions, melons, and cucumbers, were grown by the 3rd millennium B C in Ur Dates and figs were an important source of sugar in the Near East, and apples, pomegranates, peaches, and mulberries were grown in the Mediterranean area Cotton was grown and spun in India about 2000 B C, and linen and silk were used extensively in 2nd-millennium China. Felt was made from the wool of sheep in central Asia and the Russian steppes.

The horse, introduced to Egypt about 1600 BC, was already known in Mesopotamia and Asia Minor. The ox-drawn four-wheeled cart for farm work and two-wheeled chariots drawn by horses were familiar in northern India in the 2nd millennium BC. *See also* WHEEL.

Improvements in tools and implements were particularly important. Metal tools were longer lasting and more efficient, and cultivation was greatly improved by such aids as the ox-drawn plow fitted with an iron-tipped point, noted in the 10th century BC in Palestine. In Mesopotamia in the 3rd millennium BC a tunnellike device was attached to the plow to aid in seeding, and other early forms of drills were used in China. Threshing was done with animal power in Palestine and Mesopotamia, although reaping, binding, and winnowing were still done by hand. Egypt retained hand seeding through this period, on individual farm plots and large estates alike.

Storage methods for oil and grain were improved. Granaries—jars, dry cisterns, silos, and bins of one sort or another containing stored grain—supported city populations. Indeed, without adequate food supplies and trade in food and nonfood items, the high civilizations of Mesopotamia, northern India, Egypt, and Rome would not have been possible.

Irrigation systems in China, Egypt, and the Near East were elaborated, putting more land into cultivation. The forced labor of peasants and the bureaucracy built up to plan and supervise the work of irrigation were probably basic in the development of the city-states of Sumer (q.v.). Wind and water mills, developed toward the end of the Roman period, increased control over the many uncertainties of weather.

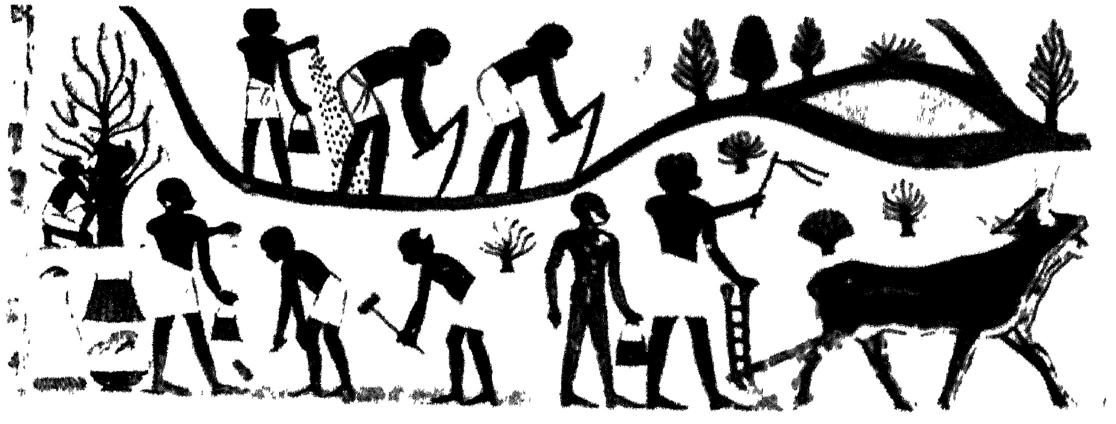
The introduction of fertilizer, mostly animal manures, and the rotation of fallow and crop land made agriculture more productive.

Mixed farming and stock raising were flourishing in the British Isles and on the continent of Europe as far north as Scandinavia at the beginning of the historical period, already displaying a pattern that persisted throughout the next 3000 years. According to region, fishing and hunting still supplemented the food grown by agriculturists.

Shortly after the time of Gaius Julius Caesar (q.v.), the Germans (see TACITUS, CORNELIUS) were described as a tribal society of free peasant warriors, each of whom cultivated his own lands or left them to fight. About 500 years later, a characteristic European village had a cluster of houses in the middle, surrounded by rudely cultivated fields, comprising individually owned farmlands, and meadows, woods, and wasteland used by the entire community. Oxen and plow passed from field to field, and harvesting was cooperative.

Rome (q.v.) appears to have started as a rural agricultural society of independent farmers. In the 1st millennium BC, after the city was established, however, Italian agriculture started a capitalistic development that reached a peak in the Christian era. The large estates that supplied grain to the cities of the empire were owned by absentee landowners and were cultivated by slave labor under the supervision of hired overseers. As slaves, usually war captives, decreased in number, tenants replaced them. The late Roman villa of the Christian era approached the medieval manor in organization; slaves and dependent tenants were forced to work on a fixed schedule, and tenants paid a predetermined share to the estate owner. By the 4th century AD, serfdom (q.v.) was well established, and the former tenant was attached to the land.

An Egyptian mural of the 15th century BC illustrates agricultural implements and practices of that period, including hand sowing and the use of hoes and plows.



See also ARCHEOLOGY: *Current Research: The Urban Revolution*; CHINA, PEOPLE'S REPUBLIC OF: *History*; CITY: *Historic Development*; EGYPT, ARAB REPUBLIC OF: *History*; MESOPOTAMIA; ROME, HISTORY OF.

Feudal Agriculture. The feudal period in Europe began soon after the fall of the Roman Empire, reaching a height about 1100 A.D. This period was also that of the development of the Byzantine Empire (q.v.) and of the power of the Saracens (q.v.) in the Middle East and southern Europe; *see* CALIPH. Spain, Italy, and southern France, in particular, were affected by events outside continental Europe; *see* MOORS; NORSEMEN.

In the Arab period in Egypt and Spain, irrigation was extended to previously sterile or unproductive land. In Egypt, grain production was sufficient to allow the country to sell wheat in the international market. In Spain, vineyards were planted on sloping land, and irrigation water was brought from the mountains to the plains. In some Islamic areas, oranges, lemons, peaches, and apricots were cultivated.

Rice, sugarcane, cotton, and such vegetables as spinach and artichokes, as well as the characteristic Spanish flavoring saffron (q.v.), were produced. The silkworm and its food, the mulberry tree, were grown; *see* SILK: *History*.

By the 12th century agriculture in the Middle East was static, and Mesopotamia, for example, fell back to subsistence level when its irrigation systems were destroyed by the Mongols; *see* MONGOL DYNASTIES. The Crusades (q.v.) increased European contact with Islamic lands and familiarized western Europe with citrus fruits and silk and cotton textiles. For a general description of life in Europe during the feudal period, *see* FEUDALISM; MIDDLE AGES.

It should be pointed out that the practice of agriculture was not uniform. In Scandinavia and eastern Germany, the small farms and villages of previous years remained. In mountainous areas and in the marshlands of Slavic Europe, the manorial system could not flourish. Stock raising and olive and grape culture were normally outside the system.

A manor required some 900 to 2000 acres of arable land and the same amount of other prescribed lands—waste, woodlots, pasture, and so forth. Typically, the manor was a self-contained community. On it was the large home of the holder of the fief—a military or church vassal of rank—or of his steward. A parish church was frequently included, and the manor might make up the entire parish. One or more villages might be located on the manor, and village peasants were the actual farmers. Under the direction of an overseer, they produced the crops, raised the meat and draft animals, and paid taxes in services, either forced labor on the lord's lands and other properties or forced military service.

A large manor had a mill for grinding grain, an oven for baking bread, fishponds, orchards, perhaps a wine or oil press, and herb and vegetable gardens. Bees were kept to produce honey.

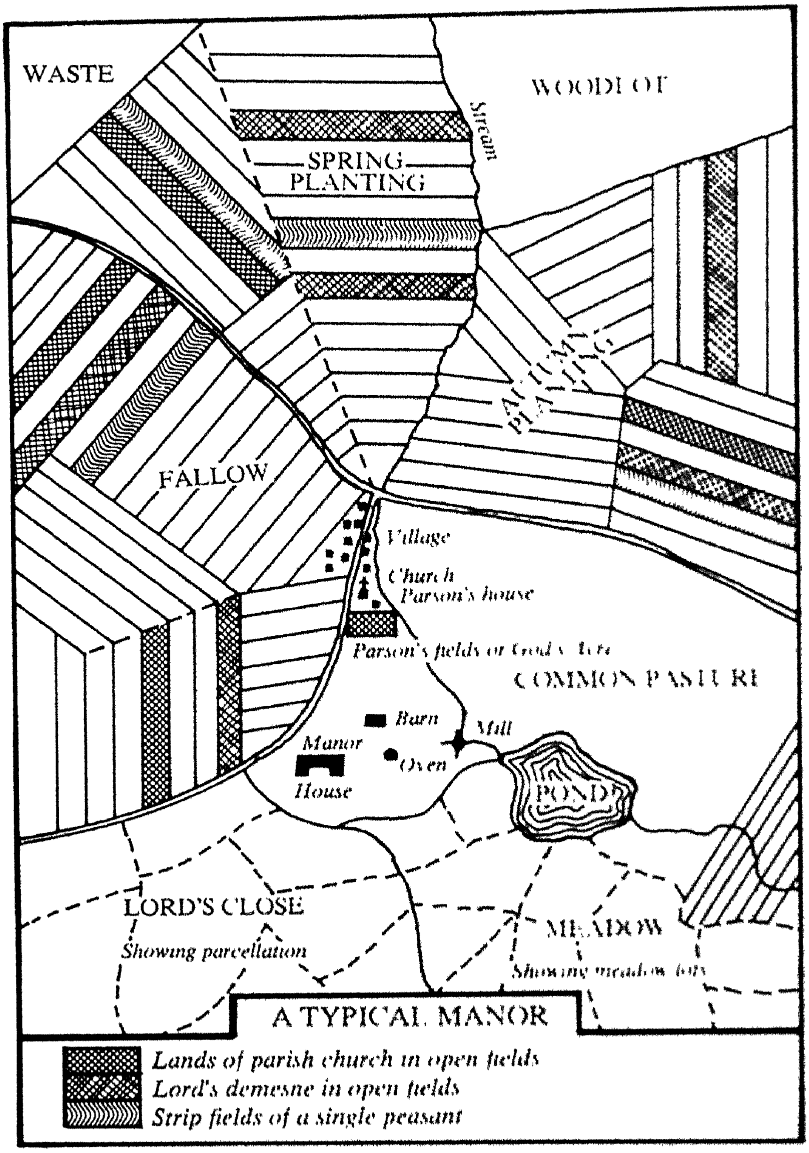
Woolen garments were produced from sheep raised on the manor. The wool was spun into yarn, woven into cloth, and then sewn into clothing. Linen textiles could also be produced from flax grown for oil and fiber.

The food served in a feudal castle or manor house varied—depending on the season and the lord's hunting prowess. Hunting for meat was, indeed, the major nonmilitary work of the lord and his military retainers. The castle residents could also eat domestic ducks, pheasants, pigeons, geese, hens, and partridges, fish, pork, beef, and mutton, cabbages, turnips, carrots, onions, beans, and peas. Bread, cheese and butter, ale and wine, apples and pears also appeared on the table. In the south, olives and olive oil might be used, often instead of butter.

Leather was produced from the manor's cattle. Horses and oxen were the beasts of burden; as lighter plows were developed, the horse became more important. A blacksmith, wheelwright, and carpenter made and maintained agricultural implements.

The cultivation regime was rigidly prescribed. The arable land was divided into three fields: one sown in the autumn in wheat or rye, a second sown in the spring in barley, rye, oats, beans, or peas, and the third left fallow. The fields were laid out in strips distributed over the three fields, and without hedges or fences to separate one strip from another. Each peasant was allotted about thirty strips. Helped by his family and a yoke of oxen, he worked under the direction of the lord's officials. When he worked on his own fields, he followed village custom that was probably as rigid as the rule of an overseer.

About the 8th century a four-year cycle of rotation of fallow appeared. The annual plowing routine on 400 acres would be 100 acres plowed in the autumn, 100 in the spring, and 200 acres of fallow plowed in June. These three periods of plowing, over the year, would produce two crops on 200 acres. Typically, ten or more oxen were hitched to the tongue of the plow, often little more than a forked tree trunk with a



An English manor of the late medieval period typically employed a three-field system of cultivation, with each field divided into individual strips.

sharpened angle stud and without share or moldboard. The oxen were no larger than modern heifers. At harvesttime, all the peasants, including the women and children, were expected to work in the fields. After the harvest, the community's animals were let loose on the fields to forage.

In the strip system, each strip, with an area of roughly one acre, measured about 220 yd. in length and from 4 ft. to 16.5 ft. in width. The lord's demesne included strips similar to those of the peasant, distributed throughout good and bad field areas. The parish priest might have lands separate from the community fields or strips that he worked himself or that were worked by the peasants.

The lord's fields came first, but about three days a week might be left for work on the family strips and garden plots. Wood and peat for fuel were gathered from the commonly held woodlots, and animals were pastured on village meadows. When surpluses of grain, hides, and wool were produced, they were sent to market.

About 1300 a tendency to enclose the common lands and to raise sheep for their wool alone first became apparent. The movement toward town living and the rise of the textile industry made sheep raising more profitable in England, Flanders, Champagne, Tuscany, Lombardy, and the region of Augsburg in Germany. At the same time, regions about the medieval towns began to specialize in garden produce and dairy products. Independent manorialism was also affected by the wars of 14th- and 15th-century Europe and by the widespread plague (q v) outbreaks of the late 14th century. Whole villages were wiped out, and much arable land was abandoned The remaining peasants were discontented and attempted to improve their conditions, *see* JACQUERIE, PEASANTS' WAR

With the decline in the labor force, only the best land was kept in cultivation, and in southern Italy, for instance, irrigation helped to increase production on the more fertile soils The emphasis on grain was replaced by diversification, and crops requiring more care were produced Among these were wine, oil, cheese, butter, and vegetables.

For the transition period from feudalism to modern Europe, *see* EUROPE: *History,* HUNDRED YEARS' WAR; REFORMATION; RENAISSANCE

Scientific Agriculture. By the 16th century, population was increasing in Europe, and agricultural production was again expanding

The nature of agriculture there and in other areas was to change considerably in succeeding centuries Several factors can be identified. Europe was cut off from Asia and the Middle East by an extension of Turkish power; *see* TURKEY· *History.* New economic theories were being put into practice, directly affecting agriculture. And continued wars, between England and France, within each of these countries, and in Germany consumed capital and manpower; *see* ENGLAND: *History;* FRANCE: *History;* THIRTY YEARS' WAR

A new period of exploration and colonization was undertaken to circumvent Turkey's control of the spice trade, to provide homes for religious refugees, and to provide wealth for European nations convinced that only precious metals constituted wealth. *See* COLONY, COMMERCE; EXPLORATION, GEOGRAPHIC, IMPERIALISM, MERCANTILE SYSTEM, THE; MIGRATION

Colonial agriculture was carried out not only to feed the colonists, but to produce cash crops and to supply food for the home country. This meant cultivation of such crops as sugar, cotton, tobacco, and tea and production of animal products such as wool and hides. From the 15th century to the 19th century the slave trade provided needed laborers, replacing natives killed by unaccustomed hard labor in unfavorable climates and substituting for imported Europeans on colonial plantations that required a larger labor force than the colony could provide. Negro slaves worked, for instance, in the Caribbean area on sugar plantations and in North America on indigo and cotton plantations. Indians were virtually enslaved in Mexico. Ultimately, however, both slavery and serfdom were substantially wiped out in the 19th century *See* COLONIAL LIFE IN NORTH AMERICA, PEONAGE, PLANTATION, SLAVERY

When encountered by the Spanish conquistadors, the more advanced Indians in the New World had intensive agricultural economies but no draft or riding animals and no wheeled vehicles Squash, beans, peas, and corn had long since been domesticated Land was owned by clans and other kinship groups or by the "state", but not by individuals or individual families Several civilizations had risen and fallen in Central and South America by the 16th century Those met by the Spanish were the Aztec, Inca, and Maya (qq.v) *See also* MEXICO. *History,* PERU *History*

The scientific revolution resulting from the Renaissance and the Age of Enlightenment in Europe encouraged experimentation in agriculture as well as in other fields; *see* AGRICULTURAL EDUCATION ENLIGHTENMENT, AGE OF, SCIENCE Experiments in plant breeding produced improved crops, and new strains of cattle and sheep were developed by controlled "trial-and-error" methods Enclosure was greatly speeded up in the 18th century, and individual landowners could determine the disposition of land and of pasture, previously subject to common use Crop rotation, involving alternation of legumes with grain, was more readily practiced outside the village strip system inherited from the manorial period. In England, where scientific farming was most efficient, enclosure brought about a fundamental reorganization of land ownership From 1660 on, the large landowners had begun to add to their properties, frequently at the expense of small independent farmers. By Victorian times, the agricultural pattern was based on the relationship between the landowner, dependent on rents; the farmer, producer of crops; and the landless laborer, the "hired hand" of American farming lore. Drainage brought more land into cultivation, and, with the industrial revolution (q.v.), farm machinery was introduced.

Early implements included an improved plow imported from the Low Countries into England and Scotland in the first half of the 18th century, and various types of threshing machines were developed in the second half. The seed drill of the English agriculturist Jethro Tull (1674–1741) about 1700 was a particularly notable development.

Mechanization in Western Europe and in the

U.S. began in earnest in the 19th century. The steel plow of John Deere (1804–86), an American blacksmith and manufacturer, was used to advantage in the prairies of the U.S. after the 1830's. Steam power was frequently used to replace animal power in drawing plows and in operating threshing machinery soon after the middle of the century.

The demand for food for urban residents and raw materials for industrial plants produced a realignment of world trade. Science and technology developed for industrial purposes were carried over into agriculture, eventually resulting in the agribusinesses of the middle of the 20th century.

The 17th and 18th centuries saw the first systematic attempts to study and control pests. Before this time, handpicking and spraying were the usual methods of pest control. In the 19th century, poisons of various types were developed for use in sprays, and biological controls such as predatory insects were also used. Resistant plant varieties were cultivated; this was particularly successful with the European grapevine, in which the grape-bearing stems were grafted onto resistant American rootstocks to defeat the *Phylloxera* aphid. *See* ENTOMOLOGY, ECONOMIC.

Improvements in transportation affected agriculture. Food could be protected in transport and shipped more economically than before as a result of rail, ship, and refrigeration developments of the late 19th and early 20th centuries. Efficient use of these developments led to increasing specialization and eventual changes in the location of agricultural suppliers. In the last quarter of the 19th century, for example, Australian and North American suppliers displaced European suppliers of grain in the European market. When grain production proved unprofitable, specialization in other areas—dairying, cheesemaking, and others—were emphasized; see *World Agriculture*, above.

The interrelationships between agriculture and population have always been evident. The impetus toward more food production in the era following World War II was a result of a new population explosion. A so-called green revolution, the adaptation of traditional crops, emphasizing high yields and intensive cultivation methods, to the climates and cultural conditions of densely populated countries such as India, temporarily stemmed the pressure for more food. But a worldwide shortage of sources of energy (that is, coal and petroleum) in the mid-1970's reduced the supplies of fertilizer necessary to the success of the new cultivation methods. In the meantime erratic weather and natural disasters such as drought and floods killed hundreds of thousands of people in areas in Africa south of the Sahara and reduced crop levels throughout the world. Famine (q.v.) seemed to be imminent in the Indian subcontinent. Economic conditions, particularly uncontrolled inflation, threatened the food supplier and the consumer alike. These problems were the new determinants of agricultural change and development in the 1970's. See POPULATION STUDY.

AGRICULTURE IN THE UNITED STATES

In North America agriculture had progressed further before the coming of the white man than is commonly supposed. See *History*, above.

Until the 19th century agriculture in the U.S. shared the history of European and colonial areas. But the availability of vast stretches of previously uncultivated land made American farmers somewhat more innovative. They were aided by the establishment of governmental agencies for the promotion of agriculture (see AGRICULTURE, DEPARTMENT OF), the voluntary cooperation of farmers through associations (see COOPERATIVE MOVEMENT; NATIONAL GRANGE), and the increasing use of various types of power machinery on the farm.

In the 20th century steam, gasoline, diesel, and electric power came into wide use. Synthetic fertilizers were manufactured in greatly increased quantities, and soil analysis was widely employed to determine the elements needed by a particular soil to maintain or restore its fertility. The loss of soil by erosion (q.v.) was extensively combated by the use of cover crops (quick-growing plants with dense root systems to bind soil), contour plowing (in which the furrow follows the contour of the land and is level rather than a slanted, potential channel for run-off water), and strip cropping (sowing strips of dense-rooted plants to serve as waterbreaks or windbreaks in fields of plants with loose root systems); see also DUST BOWL.

Selective breeding produced improved strains of both farm animals and crop plants. Hybrids of desirable characteristics were developed; see HYBRID. New uses for farm products, by-products, and wastes were discovered. Standards of quality, size, and packing were established for various fruits and vegetables. Among the first to be standardized were apples, citrus fruits, celery, berries, and tomatoes. Improvements in storage and transportation also increased the marketability of farm products. The use of cold-storage warehouses and refrigerated railroad cars was supplemented by the introduction of refrigerated motor trucks, by rapid delivery by airplane, and by the quick-freeze process of preservation, in which farm produce is frozen and packaged the same day that it is picked Freeze-drying and irradiation have also reached practical application for a variety of perishable foods

Scientific methods have been increasingly applied to pest control by widespread use of insecticides and fungicides and quarantine of infected districts. New understanding of significant biological control measures has made possible more effective control of certain kinds of insects

Chemicals for weed control have become important for a number of crops, in particular cotton and corn. The increasing use of chemicals for the control of insects, diseases, and weeds has brought about careful enforcement of the pure food and drug laws dealing with food adulterants and additives These regulations make strong demands on the skill of farm operators

Price-Support Measures. One of the recurring problems of American agriculture in the 20th century has been the tendency of farm prices and income to lag behind increases in the general price level and in urban income. The problem began to manifest itself in the 1920's, following a period of exceptional prosperity for U.S. farmers. During the years between 1896 and 1915, nonfarm production rose more rapidly than farm production, and the demand for farm products was considerably increased by a high rate of population growth and by rising incomes. As a consequence, prices paid for farm products rose faster than general prices. The period 1909–14 was later taken as a standard for the level of farm prices in relation to the general price level. After the outbreak of World War I the U.S. became the chief source of food for the warring nations of Europe, with U S. farmers bringing some 80,000,000 additional acres of land under cultivation and investing heavily in new equipment. These measures, however, did not really begin to raise production levels until 1920, when both the domestic and the European demand for U S. farm products had declined.

Farm income had scarcely begun to recover when the Great Depression of the 1930's exacerbated the economic difficulties of the farmer. By 1932 the level of farm prices was only about 65 percent of the 1909–14 average. Farmers continued to produce almost as much as before. Although prices for industrial goods declined, they did not drop as severely as farm prices, so that by 1932 the ratio of prices received to prices paid by farmers reached an all-time low of 58 percent, that is, they were receiving only $0 58 from the sale of their products for every dollar that they had to pay for nonfarm items.

The Federal government, which had done little in the 1920's to reduce the disparity between rural and urban incomes, initiated remedial programs during the administration of President Franklin D Roosevelt (q v) During this period the concept of parity came into use According to this concept, the prices farmers received for their commodities in the period 1909–14 bore a fair relationship to the prices they had to pay for goods they bought, and the period was therefore taken as a standard In order to achieve satisfactory farm prices, the Administration decided to reduce the supply of basic farm commodities. The Agricultural Adjustment Act of 1933 provided payments to farmers in return for agreements to curtail their acreage or their production of certain basic commodities The Act was declared unconstitutional in 1936, but in 1938, after several changes in the membership of the Supreme Court of the United States, a second Agricultural Adjustment Act was passed under which production quotas were set as before. The government agreed to buy crops at parity prices from participants in its program to limit production. The government also lent money to farmers to enable them to withhold crops from the market when prices were low and to store the produce so that it might be available in poor crop years.

Until World War II the problem of low farm prices was not basically a result of overproduction. Rather, it was a consequence of the cycles of business and weather, and of problems of internal distribution, transportation, and credit. Following World War II, however, overproduction became a serious problem Both during and immediately after the war, farm prices were generally high. Because production costs also were high, parity payments remained in force. Federal transactions in surplus commodities, principally the sale of such commodities at prices less than those paid to farmers, proved very costly for the government To reduce costs of the Federal farm program, the administration of President Dwight D. Eisenhower (q.v.) proposed the substitution of flexible or variable price supports for the rigid 90 percent of parity that was in force. A bill authorizing a sliding scale of payments at 82½ percent to 90 percent of parity on the basic commodities was enacted by the United States Congress in 1954.

The Agricultural Act of 1956, otherwise known as the soil-bank program, authorized

Federal payments to farmers if they reduced production of certain crops. A subsidy plan was formulated whereby farmers would be paid for converting part of their cropland to soil-conserving uses. In practice, the farmers shared the costs of planting trees or grasses and received annual payments compensating them for the economic loss incurred by the removal of some of their land from production.

The Department of Agriculture in the administrations of Presidents John F. Kennedy and Lyndon B. Johnson (qq.v.) during the 1960's made control of overproduction a primary goal of farm policy. Farmers were offered what was in effect a rental payment for a part of their land that would be taken out of production during the following year. At the same time, measures were undertaken to expand the export market for agricultural products. During this period the ratio of a farmer's per capita income to that of a non-farm person increased from about 50 percent to about 75 percent.

Direct subsidies for withholding agricultural land from production were phased out in 1973, as a result of a proposal by President Richard M. Nixon (q.v.). In the same year, net agricultural income swelled to $33.4 billion.

Poor grain harvests in the Soviet Union and a disastrous drought in sub-Saharan Africa helped to keep world demand for U.S. produce high through the early and mid 1970's, but toward the end of the decade supply again began to outrun demand. Net farm income in the U.S. fell to about $20 billion, and in 1978 a limited voluntary output restriction program was begun under a law signed by *President* (James Earl) Jimmy Carter (Jr.).

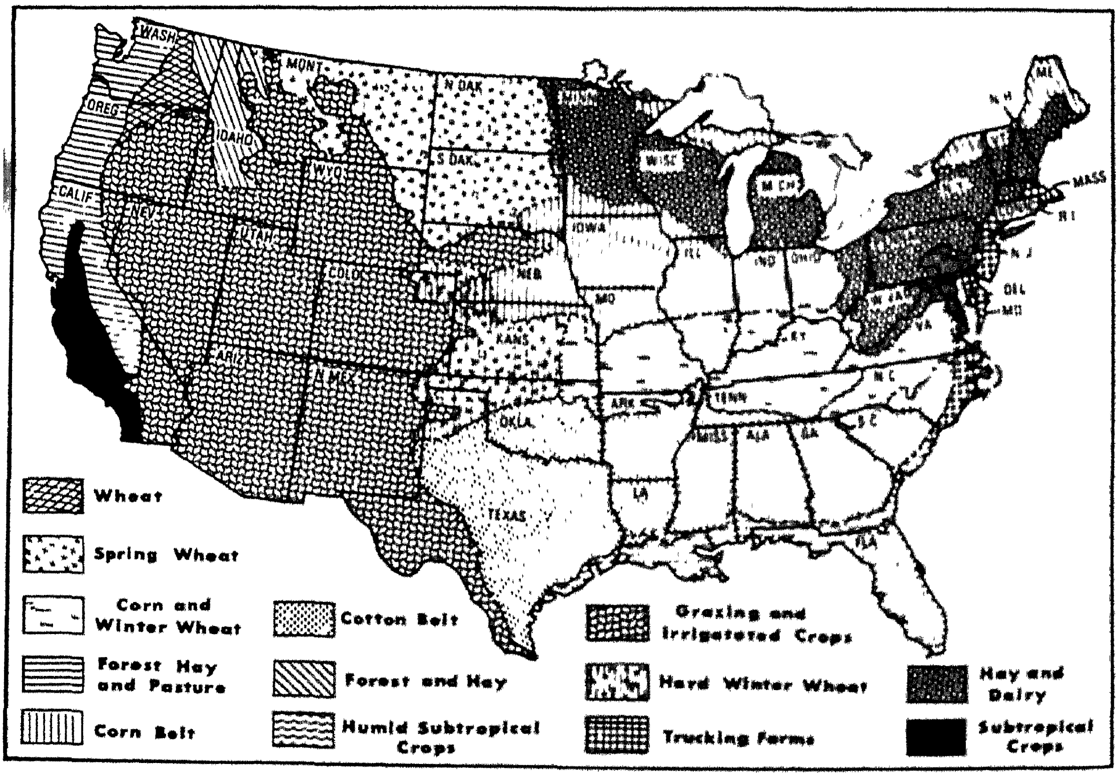
Agricultural Exports. The U.S. is the world's principal exporter of agricultural products. In the mid-1970's the value of produce exported was about $24 billion, including roughly $2.5 billion in donations and loans to developing countries.

About 44 percent of the wheat produced in the U.S. is exported, along with 45 percent of the soybeans, 30 percent of the tobacco, and 26 percent of the feed corn. The principal foreign markets for U.S. goods are Canada, Japan, Western Europe, and the Soviet Union.

Types of Farming. The self-sufficient farm of colonial America produced most if not all of the farm family's needs. As the U.S. expanded, however, certain crops were grown mainly in specific areas.

The upper Mississippi Valley is the center for corn, producing 90 percent of the annual output. The deep soil and warm growing season are particularly suited to the hybrid varieties of corn

Agriculture in the United States



introduced in the 1930's Commercial wheat production is centered in the Great Plains and parts of the Pacific Northwest The growing season and rainfall in these areas are more favorable to wheat than to corn, and the topography allows the use of large agricultural machinery.

Cotton, requiring a long, hot growing season, early became an important crop in the South Mechanical harvesting equipment and extensive irrigation have also enabled growers to cultivate cotton in the Southwest.

Tobacco growing is highly specialized, with the leading States, North Carolina, Kentucky, and South Carolina, all growing distinctive types Some tobacco for cigar fillers, binders, and wrappers is grown in the North, often shaded by cheesecloth to conserve the moisture in the soil and air. This enables farmers to grow thin-leaved plants needed for cigar binders and wrappers The U S., exporting more than one fourth of its production, is the world's largest producer of tobacco with over 19 percent of the world crop.

Vegetable and dairy production tend to be concentrated near large cities Refrigeration and rapid transportation have resulted, however, in the development of large acreages of vegetables along the Gulf and Atlantic coasts and in the irrigated valleys of the West, and of dairy regions in the northern parts of the North Central States

Citrus fruits grow only in areas where the temperature seldom drops below freezing Apple orchards do well in mountain valleys, often on slopes too steep for other cultivation. In 1964, 58 percent of the land planted with groves, fruit trees, nut trees, and vineyards was in California and Florida. Other leading States are Washington (apples and pears), Michigan (cherries), Texas (pecans), Oregon (filberts), and Massachusetts (cranberries).

Livestock raising is also specialized (see *Animal Husbandry*, below). The production of hogs has tended to be concentrated in the corn belt States of Iowa, Illinois, Indiana, and Nebraska. Beef cattle production, which requires feed corn but depends perhaps more on the availability of good pasture, is concentrated in such States as Texas and Kansas as well as those of the corn belt. Sheep raising is carried on mainly in the mountains and drier ranges of the western States.

Because poultry grows well in confinement, there is no one area of specialization except for ducks, nearly all of which are grown in a relatively small area of Long Island, New York. Otherwise, the leading poultry States are California, Georgia, Pennsylvania, North Carolina, Arkansas, and Texas for eggs; Arkansas, Georgia, Alabama, North Carolina, Mississippi, and Maryland for broilers, and California and Minnesota for turkeys

Agricultural Economics. The total land area of the U S is about 2 264 billion acres, of which about 47 percent is used for farming In the northern Plains States more than 95 percent of the land area is farmland, in the South 62 percent, in the West 45 percent, and in Alaska less than 1 percent. About 363,000,000 acres were under cultivation in the mid-1970's; this represented a decrease from 387,000,000 acres at the beginning of the decade, despite large increases in production for export

The history of agriculture in the U S since the depression has been one of consolidation and increasing efficiency From a high of 6,800,000 farms in 1935, the total number of farms declined to 2,800,000 in the mid-1970's—but on virtually the same number of acres (1 06 billion acres in 1935, 1 09 billion acres in the 1970's) While the average size of a farm in 1935 was 155 acres, today it is 393 acres

U.S farm population in the mid-1970's was 8,253,000, or 3 9 percent of the population One farmer could produce enough food to feed 56 other people, as against 20 other people 20 years earlier. Continuing a long upward trend, farm output per man hour increased by more than 40 percent from 1967 to 1976

About 61 5 percent of farms in the U S was fully owned by their operators in the 1970's, 27 1 percent was partly owned and 11 3 percent was operated by tenants The percentages forty years earlier were about the same, except that in the 1930's there were about three times as many tenant-operated farms. Outstanding farm debt in the mid-1970's was $101 8 billion, of which about 56 percent was owed on real estate Interest payments on the mortgage debt amounted to more than $4 billion per year.

In the mid-1970's the total value of land and buildings on U.S. farms was about $308.9 billion, the value of products sold was about $80.6 billion per year. Net farm income was over $20 billion, up from about $12.9 billion ten years earlier. Average income per farm at mid-decade was about $7200, up from $3800 in 1965.

Major non-real-estate expenditures by farmers were for feed ($13 9 billion), fertilizer ($6.2 billion), seed ($2.3 billion), machinery and equipment ($4 9 billion), and hired farm labor (nearly $7 billion).

Farm Management. This branch of agriculture applies economic and business principles to the

AGRICULTURAL INCOME IN THE UNITED STATES[1]

Year	1950	1955	1960	1965	1970	1975
Income from livestock and livestock products	16,100	16,000	18,900	21 800	29,600	42,902
Income from crops	12,400	13,500	15 100	17 300	19,600	51,271
Government payments of subsidies and bonuses	300	200	700	2 500	3 700	807
Nonmoney income. Value of housing and products used in farm homes	4,300	3,600	3,500	4 200	3,600	7,203
Gross income	33,100	33 300	38,300	45 800	56,600	98,175
Costs of production	19,400	21,900	26,200	30 900	40,900	25,484
Net income	13,700	11,400	12,000	14,900	15,900	22,691

[1] In millions of dollars

management of farm enterprises to achieve the greatest continuous profit. It places the operation of a farm on a business basis with a view to producing at the lowest cost and to selling to the best advantage. In its theoretical aspect it merges with the study of agricultural economics.

In the U.S. strictly farm-management studies were first undertaken by the agricultural experiment station in Minnesota in 1902. The Missouri College of Agriculture established a department of farm management in 1910. Currently, most agricultural colleges offer courses on the subject. In 1904 the Office of Farm Management was organized in the U.S. Department of Agriculture. The Bureau of Agricultural Economics replaced the Office of Farm Management in 1923. In conjunction with the agricultural experiment stations in the various States, the department has made numerous studies of systems of farming as followed in different areas. Such studies naturally led to the development of cost-accounting techniques for agricultural production.

During the 1920's farm management emerged as a private profession. Skilled managers operate groups of farms, usually for absentee owners, and select tenants (farmers to work the owner's land and pay him rent, in cash or in shares of produce), employ farmhands, direct operations in the field, and market the products.

In recent years the computer has appeared as a farm-management tool. Data such as production costs, crop yields, and market prices are quickly, efficiently, and cheaply processed and tallied by the computer. Such data are especially valuable to the farmer in reducing guesswork in planning farm operations.

ANIMAL HUSBANDRY

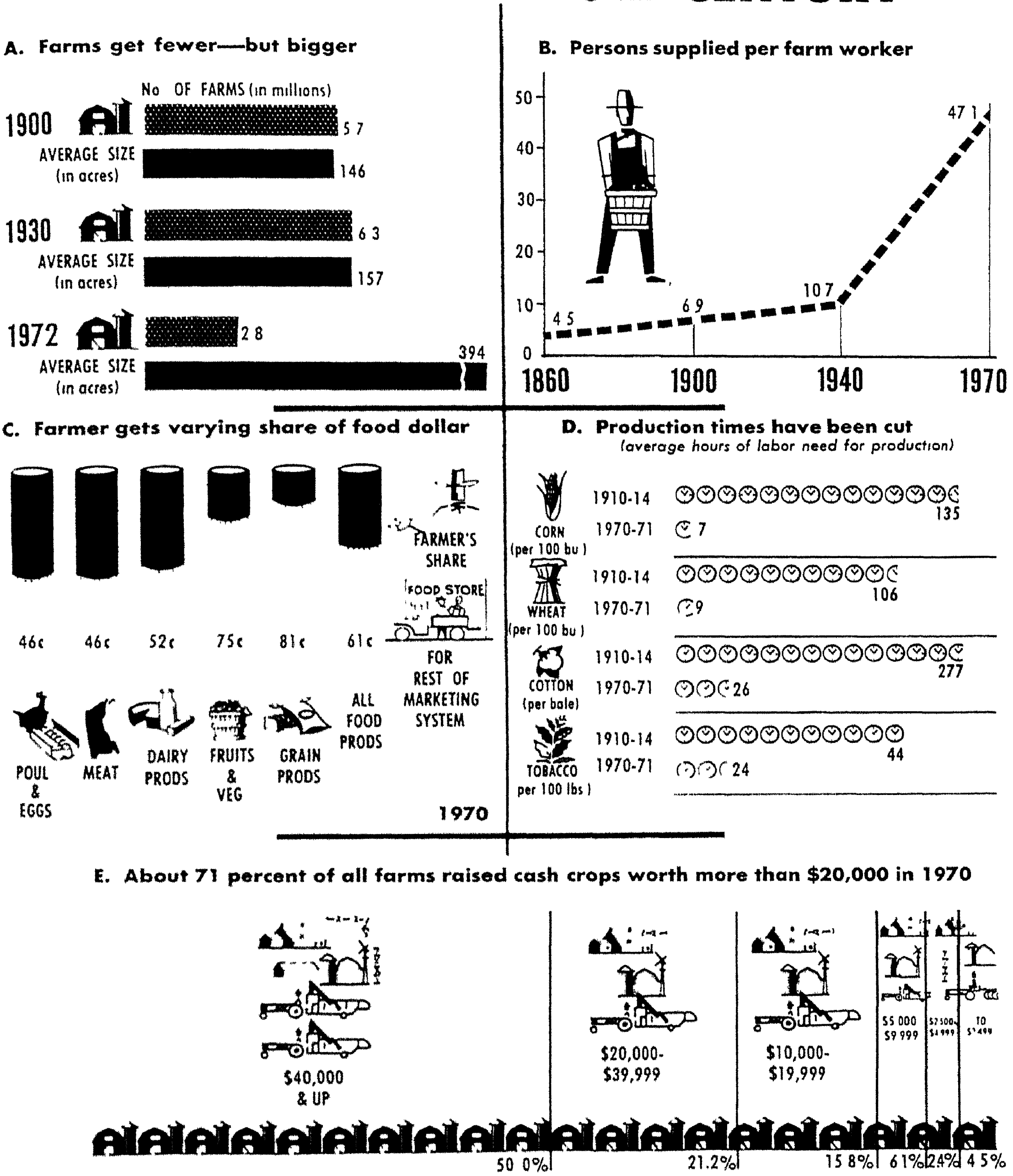
The selection, breeding, production, management, and marketing of farm animals make up a major branch of agriculture. Practices in the field are determined by such factors as acreage, types of soil, availability of markets, and inclinations of the farmer. The primary concerns of animal husbandry are dairy and beef cattle, hogs, and sheep. In the U.S. the raising and marketing of animals and their products are particularly significant and many types of animals are produced. In other countries, smaller and usually restricted in climate or geography, specialization is more likely.

Dairy Husbandry. The northeastern section of the U.S., extending from Minnesota eastward, is the principal dairy region of the country. Wisconsin, Minnesota, New York, Pennsylvania, and Iowa have the greatest number of dairy farms, but dairy enterprises tend to develop wherever demand for fresh milk is great.

Since the end of World War II the number of dairy farms and of cows and heifers raised for milk production in the U.S. has steadily declined. The amount of milk obtained per cow, however, has almost doubled. Total U.S. milk production in the mid 1970's was about 115.8 billion lb per year from 11,100,000 cows and heifers. By comparison, in 1960 production was about 106 billion lb from 19,500,000 animals. Average milk production per cow in the 1970's was 10,354 lb per year.

One reason for the marked increase in dairy efficiency has been the spread of artificial insemination, which permits the bloodlines of a single, superior bull to be passed on to 2000 to 2500 progeny each year. Other factors include the elimination of undulant fever and tuberculosis (qq.v.), better control of mastitis (inflammation of the breast or udder), improved veterinary service, greater use of special ingredients in feeding mixtures, more comfortable housing, better milking methods, and improvements in forage. Efficiency is also enhanced by the more than 1800 herd improvement associations, whose members keep detailed cost and production records for each cow. Production tests in these associations show an average milk output of more than 12,000 lb per year, well above the national average of about 9609 lb. The highest

FARMING IN THE 20th CENTURY



Agriculture in the United States The dominant trend has been toward fewer but larger farms and greater use of farm machinery; mechanization has increased the farmer's productivity and shortened his workday.

herd average to date for a herd of more than thirty cows was achieved in 1967 at 21,933 lb. per cow. A milk-production record for a single cow was set in 1974 by a Holstein that yielded 50,759 lb. of milk during a 365-day lactation period.

Persistency of milk production and reproduction of quality calves are key factors in dairy-farm efficiency. Most dairy cows calve at two years of age and give birth to a calf every twelve to thirteen months thereafter. The female calves are valued as replacements for older cows; the male offspring of the highest producers may be kept as future herd sires, the others being sold to be slaughtered for veal. The productive life of dairy cows is six to seven years.

The principal dairy breeds are Holsteins, usually the heaviest milk producers; Jerseys and Guernseys, which give milk containing a higher percentage of butterfat; and Brown Swiss. Most dairy stock now comes from ancestry largely purebred, at least on the paternal side.

Beef-Cattle Husbandry. Production of beef involves three distinct types of agricultural enterprise: breeding, ranching, and feeding. Some farmers engage in all three, but the current trend is toward specialization.

The farmer who grows purebred animals exclusively depends primarily upon selling his output as breeding stock to ranchers and other growers who wish to improve their herds.

Currently, value is based upon performance tests that measure growth efficiency, reproductive ability, and other economic factors. Purebreds having good records as individuals, families, and strains, and measuring up well on performance tests, are in steady demand. Beef cows must calve every year for three years and must produce sufficient milk to wean their calves in order that their value as calf producers can be measured. Their average reproductive life is eight to ten years.

Commercial ranchers specialize in growing calves for sale to professional feeders. A 90 percent production rate of calves per year is considered a good standard. Pasture availability and management are important, as is the ability to choose outstanding offspring to serve as replacements in cow herds.

Farmers who specialize in feeding buy the young animals when they are one year of age or less and weigh between 600 and 900 lb. In the U.S. the feeders are usually corn-belt farmers; however, large-scale feeding lots in other areas are becoming more common. The feeders may visit ranches to select their stock or obtain them from stockyards such as those at Omaha, Nebr., or Kansas City, Kans. The cattle are fed carefully prepared rations that include corn, silage, protein and mineral concentrates, hormones, and antibiotics. After a few months, when they weigh 900 to 1200 lb., the cattle are ready for slaughter. Grain-fed beef cattle are preferred to those fed on pasture alone.

Swine Husbandry. The distribution of about 55,100,000 swine in the U.S. in the mid-1970's corresponds closely with the acreage of corn, their principal feed. Swine surpass all other farm animals in the economy with which they convert feed into meat. The females are prolific. They farrow from six to twelve pigs and can produce two litters a year. Skilled hog farmers expect to raise each litter to the weight of a ton or more within six months from birth.

Hogs respond well to comfort, cleanliness, and good rations. Modern buildings for swine often include heating apparatus for young pigs, slat floors that can be easily hosed clean, and specially designed feeding devices. Provision for sanitary quarters, antibiotics, and vaccinations help to control diseases and parasites.

Grains continue to be the chief element in swine rations, but additional proteins and minerals are also included. Garbage feeding has greatly declined and where still practiced, it is permitted only if the garbage has been cooked, to prevent disease. Hog cholera, once a serious plague, has been nearly eradicated.

Most hog producers also grow crops, and many produce some beef. The combination makes possible the distribution of labor throughout the year, for animals require more attention in winter, and crops in summer.

Although most farmers produce and fatten their own pigs, some specialization has developed. One farmer may produce and sell feeder pigs, growing them only to about 60 lb. The buyer concentrates on feeding the purchased animals until they reach market weight.

Sheep Husbandry. The number of sheep in the U.S. has declined from more than 46,000,000 in 1945 to about 12,700,000 in the mid-1970's. Changes in fashion and competition from other fabrics have affected the demand for wool, and sheep raising has proven less profitable than other agricultural enterprises.

Slightly more than three fourths of the sheep raised in the U.S. in the early 1970's came from eleven States. The leading State was Texas, followed in order by Wyoming, California, Colorado, South Dakota, Montana, Utah, New Mexico, Idaho, Arizona, and Iowa—mostly Rocky Mt. States. The range flocks usually contain 1000 or more ewes. Farm flocks, some of which are found in every State, vary in size from 25 to 500

About 92 to 95 percent of sheep sold for meat are under one year of age These may be milkted lambs direct from the range pastures, or feeders shipped first from the ranges to areas where supplies of feed are abundant Lambs placed in feedlots at about 60 lb. gain 25 to 35 lb. before being marketed three months later

AGRICULTURE, DEPARTMENT OF, an executive department of the Federal government of the United States, begun about 1836 as a branch of the Office of the Commissioner of Patents with the purpose of distributing plants and seeds to farmers It was established as a department of agriculture by Congress in 1862 and raised to Cabinet level in 1889. The department carries out programs of research, education, conservation, forestry, marketing, credit, export expansion, food distribution, production adjustment, grading and inspection, and development of rural areas It is administered by a secretary appointed by the President with the approval of the Senate He is assisted by an undersecretary, four assistant secretaries, a director of science and education, and a director of agricultural economics.

About the time the department was raised to Cabinet level, the reserves of public lands available for homesteading were becoming depleted. Instead of moving from worn-out land to free or cheap fertile lands, farmers had to turn to science to increase production and income Consequently, from about 1890 on, the duties and responsibilities of the department grew rapidly. Existing units of the organization were merged, and new units were created to carry on research and service activities and to administer regulatory laws.

The growth and expansion of the Department of Agriculture continued during the depression of the 1930's, when the problem of surplus farm products became extremely acute; the department was reorganized several times. During World War II, many bureaus of the department were split off to form the War Food Administration, but these bureaus were returned to the unified control of the department in a reorganization begun just after the war.

Some of the current major units of the department are described below The Agricultural Research Service (q.v.), in addition to maintaining research in farming, farm products, marketing, consumer and food economics, and human nutrition, gives special attention to the use of safe pesticides and development of low-cost protein-rich foods to improve diets in developing countries With the continuing ability of farmers to produce more than the market demands, especially in grains, the Agricultural Stabilization and Conservation Service carries out programs aimed at keeping grain production balanced with needs. The Marketing and Consumer Services administers school lunch, special milk, food stamps, and direct food distribution programs, it also helps the Agricultural Marketing Service in assuring safe, efficient movement of products from producer to consumer and the Animal and Plant Health Inspection Service in safeguarding the health and quality of animals and plants and in protecting the consumer by means of Federal-State meat and poultry inspection

The Cooperative State Research Service administers Federal-grant funds for agricultural research by the States and participates in the coordination of major regional research projects The Economic Research Service produces studies on agricultural prices, income, and food and fiber demand and supply The Foreign Agricultural Service works to develop markets abroad and expand agricultural exports. Under its sponsorship, about 375 technicians of the department work in some thirty-five developing nations to improve agriculture, and about 4000 officials of developing nations annually receive agricultural training in the U S

The Rural Community Development Service coordinates department activities aimed at fostering opportunity and economic growth in rural America The Soil Conservation Service has the function of helping to develop natural resources, control erosion and sedimentation, prevent floods, and plan community use of land Technical service is given each year to more than 1,000,000 persons in some 3000 soil-conservation districts and 1200 watershed projects The Statistical Reporting Service gathers data on about 150 crop and livestock products and issues some 700 reports annually

Other units of the Department of Agriculture are the Commodity Credit Corporation, the Farmers Home Administration, the Federal Extension Service, the Forest Service, and the Rural Electrification Administration (qq v.)

AGRIGENTO (Lat *Agrigentum,* Gr *Akragas*), city of Italy, on the island of Sicily, capital of Agrigento Province, 5 mi. N of Porto Empedocle on the Mediterranean Sea. The city is a tourist and an agricultural trading center; it processes sulfur and food and manufactures cement and furniture. The city has ruins of twenty Greek temples, including the excellently preserved Temple of Concord, the Temple of Hera Lacinia, the colossal Temple of the Olympian Jove, and the Temple of Heracles, all dating from the 5th and 6th centuries B.C. Agrigento is an episcopal see.

Akragas was founded by Greeks from the city of Gela (q.v.), about 582 B.C. and became an important trading and cultural center with a population of about 200,000. It was the birthplace of the Greek philosopher Empedocles (q.v.). After 406 B.C., when it was sacked by a force from Carthage (q.v.), Akragas declined in importance, although it remained a large city throughout antiquity. In 262 B.C. it was incorporated into the Roman Empire and became known as Agrigentum. It was called Girgenti from the early Middle Ages until 1928, when the name was changed officially to Agrigento. During World War II it was the scene of a great artillery battle; the town was taken by American troops on July 16, 1943. Pop. (1971) 49,293.

AGRIMONY, common name for hardy perennial herbs of the genus *Agrimonia* in the Rose family (Rosaceae). *Agrimonia* has fifteen species, all native to northern temperate regions. It has interruptedly pinnate leaves, with the leaflets serrate and downy beneath; the flowers are small and yellow, in close racemes; and the fruit is armed with hooked bristles. The plants grow to a height of about 2 to 3 ft. Common agrimony, *A. eupatoria,* is native to Europe; *A. parviflora,* a closely similar species distinguished by slightly smaller flowers, is found in temperate regions in the eastern United States.

AGRIPPA, HEROD. *See under* HEROD.

AGRIPPA, Marcus Vipsanius (63–12 B.C.), Roman general and statesman. In 36 B.C. he defeated the Roman general Pompey (see POMPEIUS: *Sextus Pompeius Magnus*) in the naval battles of Mylae (now Milazzo, Italy) and Naulochus. This victory paved the way for Octavian, heir of Gaius Julius Caesar (q.v.), to become the sole ruler of the Roman Empire.

In 31 B.C. Agrippa commanded Octavian's fleet in the victory at Actium (see ACTIUM, BATTLE OF) over the combined forces of the Roman general Marcus Antonius and Cleopatra (qq.v.), Queen of Egypt. In 27 B.C., when Octavian became the first Roman emperor, assuming the name Augustus (q.v.), Agrippa is thought to have built the Roman Pantheon (q.v.) in commemoration of the Battle of Actium.

Much of the success of the reign of Augustus was due to Agrippa. He was active in many campaigns and frequently served as provincial governor. He was one of the emperor's most trusted advisors, and in 21 B.C. married Julia (q.v.), the only child of Augustus. By Julia, Agrippa had three sons and two daughters, one of whom, Agrippina, known as the Elder (see *under* AGRIPPINA), married the Roman general Germanicus Caesar (q.v.).

AGRIPPINA, name of a famous mother and daughter of Roman antiquity.

Agrippina *or* **Vipsania Agrippina,** also known as AGRIPPINA THE ELDER (about 13 B.C.–33 A.D.), daughter of the Roman general and statesman Marcus Vipsanius Agrippa (q.v.) and Julia, daughter of the emperor Augustus (qq.v.). Agrippina is one of the most virtuous and heroic women of antiquity. She married the Roman general Germanicus Caesar (q.v.) and had nine children; the most famous of her children were Agrippina the Younger (see *below*) and Gaius Caesar, later the emperor Caligula (q.v.). Agrippina accompanied Germanicus on many of his military expeditions. After the death of Germanicus in 19 A.D., the emperor Tiberius (q.v.) is said to have distrusted Agrippina, whose sons were possible successors to the throne. In 30 A.D., at the instigation of his minister Lucius Aelius Sejanus (d. 31 A.D.), Tiberius banished her to the island of Pandateria (now Ventotene), near Naples, where she starved herself to death three years later.

Agrippina the Younger (about 15–59 A.D.), daughter of the Roman general Germanicus Caesar and Agrippina the Elder, born in Oppidum Ubiorum, a Roman outpost on the Rhine R. The outpost was later named Colonia Agrippinensis (now Cologne, West Germany) after her. Her first husband was the father of her son Lucius, better known as the emperor Nero (q.v.); she is said to have poisoned her second husband. In 49 A.D. her uncle, the emperor Claudius I (q.v.), became her third husband; he adopted Nero as his son and heir. In 54 A.D. Claudius was poisoned, presumably by Agrippina, who thus enabled Nero to become emperor. She attempted to rule through her son, but when she opposed his marriage to his second wife Poppaea Sabina (d. 65 A.D.), Agrippina was killed by his orders.

AGRONOMY, agricultural science seeking improved methods of soil management and crop production. Agronomists study plant life and soils and the complex relationship existing between them. The scientists attempt to develop techniques that will increase the yield of field crops, improve their quality, and, at the same time, conserve the fertility of the soil. Agronomic research has resulted in important new strains of disease-resistant plants and in the development of such practices as the selective breeding of crops and the use of chemical fertilizers. See AGRICULTURAL CHEMISTRY; AGRICULTURAL

Research Service, Agriculture, Conservation, Fertilizer, Plant Breeding, Soils and Soil Management

AGUA, inactive volcano in Guatemala, near the city of Guatemala. It is an imposing, cone-shaped mountain, with an elevation of 12,139 ft. The original town of Guatemala, on a site near the modern city, was destroyed when the volcano erupted in 1541. In 1917 the modern city was severely damaged by an earthquake that originated near the base of Agua.

AGUADILLA, city and seaport in Puerto Rico, on the W. coast, 65 miles W. of San Juan and 20 miles N. of Mayaguez. It has an extensive trade in sugar and coffee. According to tradition, the Genoese-born explorer Christopher Columbus (q.v.) landed on the site of Aguadilla in 1493. Pop. (1960) 15,943; (1970) 21,031.

AGUASCALIENTES, city in Mexico, and capital of the State of Aguascalientes, about 265 miles N.W. of Mexico City. The mild, pleasant climate of the area and the mineral springs near the city make Aguascalientes a favorite health resort. Local industries include the processing of many varieties of fruits and vegetables grown in the area, smelting works, railroad shops, tanneries, and cotton and other textile mills. The city is noted for the manufacture of serapes, as well as for its unique pottery. It has much fine colonial architecture, and many plazas and parks. Points of interest include a network of immense catacombs, built by an unidentified pre-Columbian people. Aguascalientes was founded in 1575 as a silver-mining town. It became an important commercial center in the 19th century, when a system of railroads was developed. Pop. (1970) 181,277.

AGUINALDO, Emilio (1869–1964), Filipino leader, born near Cavite, Luzon, and educated at the University of Saint Thomas, Manila. He led an insurrection of the Filipinos against Spanish rule in 1896, and two years later during the Spanish-American War (q.v.), he aided the American attack on the Philippine Islands. As chief of the Filipino provisional government in 1899 he resisted American occupation; he continued to lead the struggle against the forces of the United States until March, 1901, when he was captured. In April, 1901, he took an oath of allegiance to the U.S. and retired to private life. Aguinaldo was taken into custody in 1945, during World War II, by invading American troops and held on suspicion of collaboration with the enemy during the Japanese occupation of the islands. He was subsequently exonerated.

AGUIRRE, Lope de (1508?–61), Spanish adventurer, born in Oñate. He took part in the civil wars among the Spanish conquerors in Peru after that country had been conquered by Francisco Pizarro (q.v.) in 1533. In 1559 Aguirre joined an expedition to search for the legendary El Dorado (q.v.). The expedition sailed down the Amazon R. and discovered its connection with the Orinoco R. During the voyage Aguirre renounced allegiance to the king of Spain and sought to return to Peru to establish a kingdom there that would be independent of Spain. While he was marching through Venezuela, Spanish forces defeated his army and killed him at Barquisimeto.

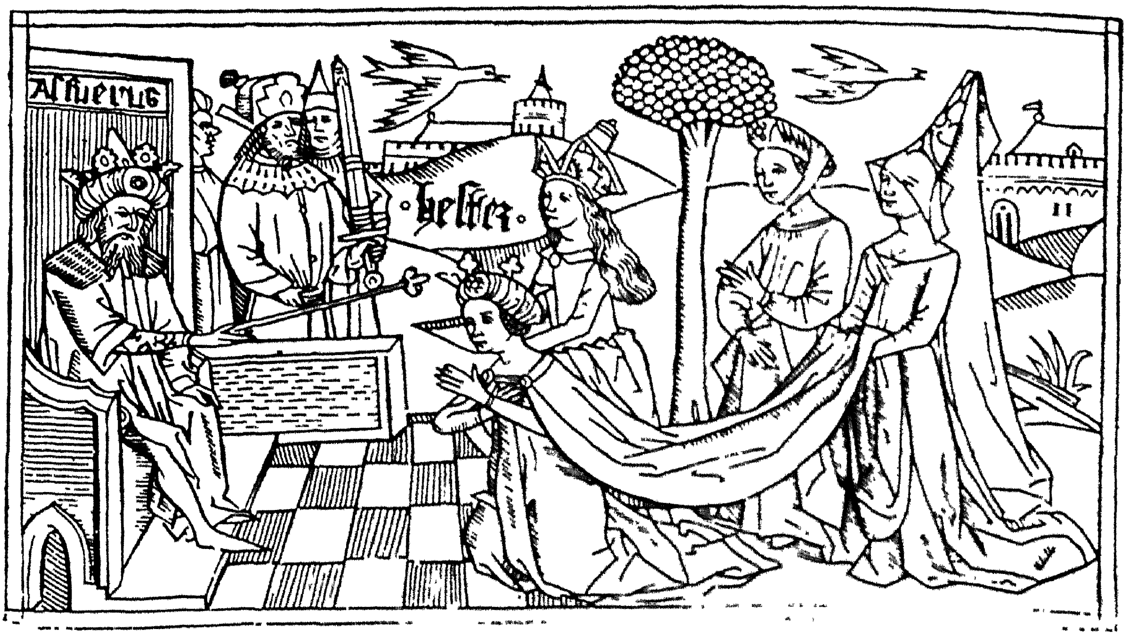
Emilio Aguinaldo UPI

AGULHAS, CAPE. *See* Cape Agulhas.

AHAB (fl. 9th cent. B.C.), King of Israel from about 875 to 853 B.C., the son and successor of Omri (r. about 887 B.C.–about 875 B.C.). Ahab married Jezebel (q.v.), a Tyrian princess, and through her influence the Phoenician worship of the god Baal (q.v.) was introduced into Israel. Ahab waged two successful wars against Ben-hadad (fl. 854 B.C.), King of Syria, but in a third campaign was killed by an arrow. His daughter Athaliah (d. 836 B.C.) married Jehoram (r. about 851 B.C.–844 B.C.), King of Judah. Ahab's entire family was killed by Jehu (q.v.), a later king of Israel.

AHASUERUS, in the Bible, the title of several kings of Media and Persia.

Ahasuerus, King of Persia (r. 486–65 B.C.), husband of the Jewish heroine Esther (fl. 5th cent. B.C.); see book of Esther. He is also generally recognized as the Persian king Xerxes I (q.v.).



Ahasuerus is paid homage by his wife, Esther

Ahasuerus, the father of the Babylonian king Darius the Mede (fl. 4th cent. B.C.)

AHAZ (r. 735?–720? B.C.), son of Jotham (r. 740?–735? B.C.) and twelfth king of Judah. Judah was attacked early in his reign by King Pekah of Israel (736–729 B.C.) and King Rezin of Syria (fl. 6th cent. B.C.), who attempted to force Ahaz into a coalition against Assyria. Additional incursions were made into Judaean territory by the Edomites, to whom Ahaz was forced to give up the important city of Elath (now 'Aqaba, Jordan). Ahaz asked help of the Assyrian king Tiglath-pileser III (r. 745–727 B.C.), who drove out the invaders but in return exacted tribute from Judah. Ahaz made various changes in the temple service and paid homage to the Assyrian gods. He was denounced for infidelity to Jehovah by the Hebrew Prophet Isaiah (q.v.), who opposed the alliance with Assyria. About 720 B.C. Ahaz was succeeded as king of Judah by his son Hezekiah (q.v.). The name of Ahaz appears on Assyrian monuments in a form that seems to justify the conclusion that the full name of Ahaz was Jehoahaz, meaning "Jehovah supports".

AHITHOPHEL. *See* ACHITOPHEL.

AHMADABAD *or* **AHMEDABAD,** city in the Republic of India, and capital of Gujarat State, on the Sabarmati R., about 290 miles N. of Bombay. The surrounding fertile agricultural region produces cotton, millet, and wheat. An important industrial and commercial center, the city is especially noted for the manufacture of cotton textiles. Silk fabrics, soap, glass, carpets, tobacco products, matches, and high-quality brocades and metal and wood articles are also produced in the city. Architecturally, Ahmadabad is one of the most magnificent cities of India. Major buildings include the Jama Masjid, or Great Mosque, an Indo-Saracenic structure with 300 elaborately carved pillars, and the temple of Hathi Singh, a Jainist shrine built in 1848. Until the division of Bombay State into the States of Gujarat and Maharashtra in 1960, Ahmadabad was the capital of Bombay State. Pop. (1971 prelim.) 1,588,378.

AHMADOU *or* **AHMANDOU** (d. 1898), emperor of Toucouleur, a former empire, largely in present-day Mali and Guinea, which had its capital at Ségou. In 1864 Ahmadou succeeded his father, Al Hajj Umar (1797?–1864). Ahmadou had difficulty in retaining the political loyalty of his subjects and as a consequence signed the Treaty of Nango in 1881, which gave France most-favored-nation status. In 1887, after the French occupied the left bank of the Niger R. as far north as Timbuktu, Ahmadou was forced to declare that area a French protectorate. By 1891 most of Ahmadou's fortresses were seized by the French and his empire soon after collapsed. He died in present-day Nigeria.

AHMAD SHAH *or* **AHMAD SHAH DURRANI** (1724–73), first amir of Afghanistan (1747–73). Ahmad was the hereditary chief of the Abdali tribe of Afghans, which he later renamed the Durrani. He led a contingent of his tribesmen in the service of Nadir Shah (1688–1747), King of Persia, who won control of most of Afghanistan and part of India. When Nadir died Ahmad founded an independent Afghan kingdom He invaded the Indian Punjab six times between 1748 and 1752 and seized Delhi in 1756 In 1761 he inflicted a severe defeat on an Indian army at Panipat Although he was a powerful military leader, Ahmad never succeeded in permanently ruling India, he subsequently withdrew into Afghanistan

AHMEDABAD. *See* AHMADABAD

AHMOSE, name of two pharaohs of ancient Egypt sometimes written AHMES, AAHMES, or, in the Greek forms, AMASIS or AMOSIS

Ahmose I, founder of the XVIII Dynasty of Egypt, Pharaoh (about 1567–46 B C) He is known for his expulsion of the Hyksos (q.v.) from Egypt.

Ahmose II, Pharaoh (569–25 B C) Born of humble parents, he became a general and was sent by the Pharaoh Apries (r 588?–569? B C) to suppress a revolt of Egyptian troops Ahmose joined forces with the rebels, who proclaimed him king The combined forces defeated the hired troops of Apries and dethroned him Ahmose added Cyprus to his kingdom, made alliances with Samos and Lydia, and maintained friendly relations with Cyrene and the Greek states. He repulsed an attack by the Babylonian king Nebuchadnezzar II (*see under* NEBUCHADNEZZAR) in 586 B C). In 585, however, the Persians under Cambyses II (*see under* CAMBYSES), defeated and dethroned Ahmose's son Psamtik III (*see under* PSAMTIK), and made Egypt part of the Persian Empire.

AHVENANMAA (Sw., Åland), province of Finland, composed of a group of islands situated at the N end of the Baltic Sea, at the mouth of the Gulf of Bothnia, between Sweden and Finland The group, known as the Åland Islands, consists of about 6500 granite islands and rocky reefs, of which approximately 80 are inhabited. Mariehamn, the administrative center and chief port, is located on Åland, the largest island, which is linked by daily ferry and steamship service to the Swedish and Finnish mainlands, and by air service from Mariehamn airport. Fishing, shipping, and tourism are the chief industries of the islands. Farming is confined to the cultivation of grains and vegetables, and to cattle raising and dairy products. The population, which is entirely Swedish-speaking, is gradually emigrating to Sweden.

The Ahvenanmaa, inhabited since prehistoric times, were Christianized by Sweden in the 12th century, and were ceded to Russia in 1809. The position of the islands made them of strategic importance during the Crimean War (q.v.), after which they were demilitarized. At the end of World War I, Finland granted the islands autonomy to quiet a strong, pro-Swedish secessionist movement. Finnish sovereignty over the islands was confirmed by a 1921 decision of the League of Nations (q v) Under pressure from the Soviet Union in 1951, the Finnish parliament renounced the autonomy guaranteed by the earlier decision, but granted the islanders special rights, including their own flag Area about 572 sq mi , pop (1971) 20,666

AHWAZ, city in Iran, and capital of Khuzistan Province, on the Karun R , about 200 miles S W of Isfahan It is at a junction of the Trans-Iranian Railway, a direct rail line connects it to Khorramshahr, Iran The Anglo-Iranian Oil Company maintains large installations in the city Ahwaz was built on the ruins of an ancient city of the same name In the 12th and 13th centuries, under Arab rule, it was the center of a fertile agricultural region Pop (1971) 270,100

AI. *See* SLOTH

AIGINA *See* AIYINA

AIGRETTE. *See* EGRET

AIKEN, city in South Carolina, and county seat of Aiken Co , about 47 miles S W of Columbia. Aiken is an industrial city located in an agricultural and timber region It has a lumber industry, and manufactures glass-fiber and wood products, and textiles The Savannah River Plant of the Atomic Energy Commission is nearby The city is also a resort area. Pop (1960) 11,243, (1970) 17,974

AIKEN, Conrad Potter (1889–1973), American poet and novelist, born in Savannah, Ga , and educated at Harvard University. His first volume of verse, *Earth Triumphant and Other Tales in Verse* (1914), although derivative in style, reveals his talent for sensuous imagery and flowing rhythms. His *Selected Poems* won the 1930 Pulitzer Prize in poetry and his *Collected Poems* won the 1954 National Book Award Later volumes of his poetry include *Cats and Bats and Things with Wings* (1965), *Preludes* (1966), *Selected Poems* (1969), and *Thee* (1971)

Aiken is also the author of numerous novels and short stories, in many of which he uses psychoanalysis as a source of inspiration and sometimes of narrative technique. His *Collected Novels* appeared in 1964. *Three Novels* (1965) includes *Blue Voyage* (1927), *Great Circle* (1933), and *King Coffin* (1935) *The Short Stories of Conrad Aiken* appeared in 1950 and his *Collected Criticism* in 1968 In recognition of his literary achievement Aiken held the Chair of Poetry of the Library of Congress from 1950 to 1952 and was awarded the Gold Medal for Poetry by the National Institute of Arts and Letters in 1958

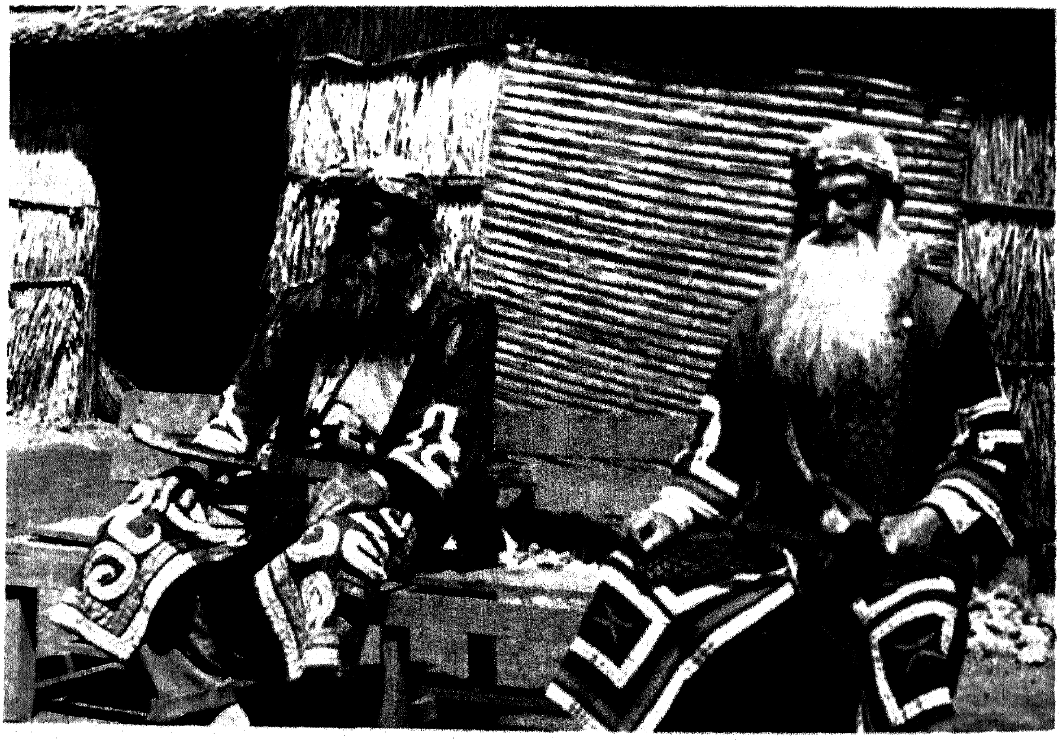
The fruit of the ailanthus tree, Ailanthus altissima.
U.S. Forest Service

AILANTHUS, genus of trees in the Quassia family (Simarubaceae), native to Asia and northern Australia. The trees grow to a height of about 60 ft. They have infrequent branches; alternate, odd-pinnate leaves; and small, greenish-yellow, polygamous flowers in large terminal panicles. The American ailanthus, or tree of heaven, *A. altissima,* now popular as an urban shade tree, is not native to the United States.

AINSWORTH, William Harrison (1805–82), British novelist, born in Manchester, England, and educated for the law. He first won recognition as an author with his historical novel *Rookwood* (1834), notable for an account of the ride of its hero, the English robber Dick Turpin (1706–39), from London to York. Ainsworth was a popular author in his time, but his work is little read today. Of about forty historical novels, his best known include *Jack Sheppard* (1839), *The Tower of London* (1840), *Old St. Paul's* (1841), and *Windsor Castle* (1843). He was editor of *Ainsworth's Magazine* from 1842 to 1853; he then edited the *New Monthly Magazine* and several other periodicals.

AINU or **AINO,** aboriginal people of Asia, chiefly occupying parts of the Japanese island of Hokkaido and the Soviet islands of the Kuriles and Sakhalin. The Ainu are thought to be descended from the ancient circumpolar people, who were gradually driven north on the Japanese archipelago by invaders now known as the Japanese. Many anthropologists believe that the ancestors of the Ainu belonged to the Caucasoid race; full-blooded Ainu are rare, owing primarily to intermarriage with Japanese. Typical members of this group of about 17,000 persons possess various Caucasoid characteristics, including light complexions, heavy beards, and thick, wavy hair. They have short sturdy bodies. A few isolated communities of upland Ainu are identical in some respects to those of prehistoric times. The Ainu language has not been related definitely to any other. The decline of traditional Ainu culture is largely attributable to reforms, introduced into Japan after World War II, which caused rapid social and economic as-

The Ainu are generally regarded as descendants of the Neolithic people of Japan.



similation of most Ainu groups by the Japanese

The Ainu social organization is based upon patrilineal kin groups, each headed by a chief Local groups usually consist of five to ten households Spawning grounds of dog salmon are owned collectively; cooperative activities within these local groups include housebuilding and a ceremony involving the dog salmon Pit-houses, ground-stone celts, ground-bone projectile points, and grit-tempered, cord-marked pottery have been uncovered by archeologists.

Ainu men are hunters and fishermen; the women gather food and also do some fishing Ainu agriculture, essentially primitive until recently, was engaged in mainly by women, who practiced a method of crop rotation The people have a basic diet of cherry salmon, dog salmon, deer, bear, and at least nine plants. Tattooing of the face and arms is common among the women, and both men and women frequently wear earrings Adult males never shave The traditional religion, predicated upon faith in a supreme deity, is a form of nature worship that revolves around a belief in spirits associated with natural phenomena and forces. A bear cult is especially prominent, an annual religious festival is climaxed by the sacrifice of a bear about three years old, which, has been reared from cubhood

Some contemporary anthropologists contend that a pure Ainu culture no longer exists, having been absorbed by that of the Japanese. E.I.K

AIR. *See* Atmosphere

AIR, in music. *See* Aria

AIR BRAKE. *See* Brakes.

AIR, COMPRESSED. *See* Compressed Air.

AIR COMPRESSOR, *or* AIR PUMP, machine that decreases the volume and increases the pressure of a quantity of air by mechanical means. Air thus compressed possesses great potential force, because when external pressure is removed, the air expands rapidly. The controlled expansive force of compressed air is used in many ways and provides the motive force for air motors and tools, including pneumatic hammers, air drills, sandblasting machines, and paint sprayers.

Air compressors are of two general types: reciprocating and rotating In a reciprocating, or displacement, compressor (see Fig 1), which is used to produce high pressures, the air is compressed by the action of a piston in a cylinder. On the upstroke of the piston, air flows into the cylinder through the intake valve; on the downstroke of the piston the air is compressed and forced through an output-control valve into a reservoir or storage tank.

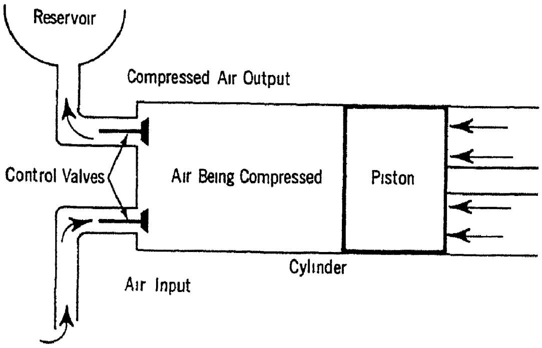


Fig 1

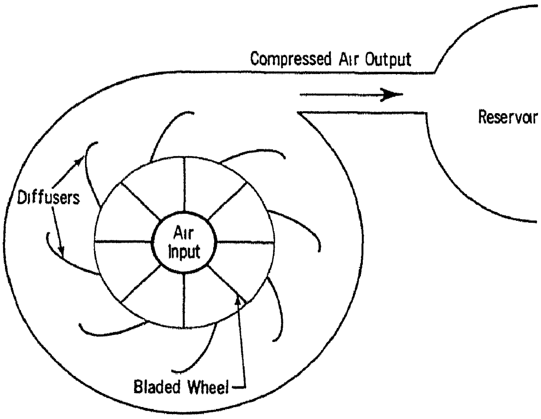


Fig. 2

A rotating air compressor (see Fig. 2), used for low and medium pressures, usually consists of a bladed wheel or fan which spins inside a closed circular housing Air is drawn in at the center of the wheel and accelerated by the centrifugal force of the spinning wheel or fan The energy of the moving air is then converted to pressure in the diffuser, and the compressed air is forced out through a narrow passage to the storage tank.

As air is compressed it is also heated Air molecules tend to collide more often with each other in a smaller space, and the energy produced by these collisions is evident as heat This heat is undesirable in the compression process, so the air may be cooled on the way to the reservoir by circulating air or water For high-pressure compressed air, several stages of compression may be employed, with the air being further compressed in each cylinder and cooled before each stage.

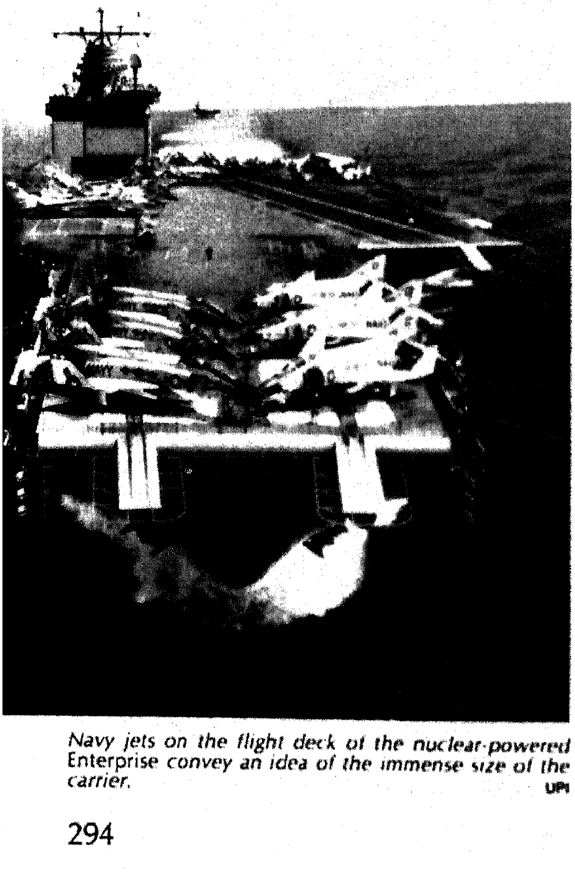
See Compressed Air; Heating, Ventilating, and Air Conditioning, Pneumatic Power, Pumps and Pumping Machinery

AIR CONDITIONING. *See* Heating, Ventilating, and Air Conditioning; Refrigeration. *Compression Systems, Absorption System.*

AIRCRAFT, weight-carrying structure that can travel through the air, supported either by its own buoyancy or by the dynamic action of the air against its surfaces. *See* AIRPLANE; AIRSHIP; AUTOGIRO; AVIATION; BALOON; GLIDER; HELICOPTER

AIRCRAFT CARRIER, naval vessel with a long, unobstructed flight deck from which aircraft can take off and land. A hangar deck immediately below the flight deck is used for storing and repairing aircraft. The control centers of the ship are located in a superstructure, or "island", on the starboard edge of the flight deck. Carriers carry no heavy guns but are armed with missiles.

In 1910 an airplane was flown off an improvised platform on the United States Navy cruiser *Birmingham*. The next year an airplane landed on and took off from a platform constructed on the U.S. Navy battleship *Pennsylvania*. During World War I (q.v.), the British converted a half-completed merchant ship into the first true aircraft carrier, the H.M.S. *Argus*. In 1922 the U.S. Navy converted a collier, the *Jupiter*, into an experimental aircraft carrier, and renamed it the *Langley*. The first U.S. Navy combatant carriers were converted battle cruisers, which joined the fleet in 1927 as the *Saratoga* and *Lexington*. The first U.S. Navy carrier built as such from the keel up was the *Ranger* which joined the fleet in 1934.



Navy jets on the flight deck of the nuclear-powered *Enterprise* convey an idea of the immense size of the carrier.

UPI

At the outbreak of World War II (q.v.), all the major maritime powers had carriers. The Japanese, at the time of their attack on Pearl Harbor (q.v.), had a total of 10, and the U.S. had 6. Of these, 6 Japanese and 4 U.S. carriers were lost during the first year of war. The U.S. rapidly began a shipbuilding program, and by the end of 1943 the U.S. Navy was able to begin major offensive operations in the Pacific. Within a year, the Japanese navy had been destroyed, primarily by carrier-based aircraft. By the end of the war, the U.S. Navy, with 98 carriers in commission, had lost 11 carriers; the Japanese had lost their entire fleet of 21 carriers. The carrier emerged from World War II as the capital ship of naval warfare.

The U.S. uses several types of carrier: the attack carrier (carrier aviation attack or CVA), the support carrier (carrier aviation support or CVS), and the amphibious assault carrier (also called landing platform helicopter or LPH).

The attack carriers in commission today differ considerably from the carriers of World War II. Their flight decks are canted, or angled, to permit simultaneous landings and takeoffs by aircraft; they use steam and hydraulic catapults to launch aircraft, and they employ a system of mirrors for guiding pilots to safe landings. Carriers of the *Midway* class (*Midway*, *Coral Sea*, *Franklin D. Roosevelt*) have a standard displacement of 62,500 tons and are 900 ft. long. Those of the *Forrestal* class (*Forrestal*, *Saratoga*, *Ranger*, *Independence*) have a standard displacement of 60,000 tons and are 990 ft. long. The *Kitty Hawk* class (*Kitty Hawk*, *Constellation*) is similar to the *Forrestal* class, but the carriers are longer and have a full-load displacement of 76,000 tons. Carriers of the *America* class (*America*, *John F. Kennedy*) have a standard displacement of 64,000 tons and are 990 ft. long. The *Enterprise* is the first nuclear-powered carrier. It has a standard displacement of 75,700 tons, is 1040 ft. long, has a beam of 133 ft., and the overhanging flight deck is 257 ft. at its widest point. Fourteen attack carriers were in active service in 1972.

Support carriers are used for antisubmarine warfare and as convoy escorts. In 1972, 7 LPH and 2 CVS were in active service.

The amphibious assault carrier has replaced the light attack carrier, whose functions were to defend carrier task forces against air attack and support amphibious operations. The amphibious assault carrier can transport a battalion of troops (2000 men), together with their equipment and twenty helicopters for use in amphibious operations. Two classes of amphibious assault carrier are in use, the *Boxer* class, consisting of converted *Essex* class carriers of World War II design, and the *Iwo Jima* class, specifically designed for amphibious operations. Ships of the *Iwo Jima* class are 593 ft. long and 105 ft. wide, with a beam of 84 ft., and a full-load displacement of 18,340 tons. M.B.

AIR-CUSHION VEHICLE, *or* GROUND-EFFECT MACHINE *or* HOVERCRAFT, craft that operates above the surface of water or land while supported on a cushion of air 4 to 8 ft. thick. The air cushion is provided by a large fan that pushes air downward within a flexible skirt attached to the outer perimeter of the vehicle. The skirt makes the vehicle appear to be operating only a few inches above the surface. The vehicle is moved forward either by propellers mounted above the vehicle or by control of the air exhaust through small openings around the skirt. Braking action is controlled by reversing the pitch of the propeller or by changing the direction of air flow through the skirt vents.

Operating controls are essentially like those found in an airplane. A control wheel adjusts the pitch of the vehicle, and rudder pedals control yaw. The speed over water is limited by wave height and wind speed. Operation of the vehicle is much the same when moving from water to land, or vice versa, the air cushion prevents the hull from striking the ground when the terrain changes.

Some air-cushion vehicles, such as the Bertin Hovertruck, have conventional wheel systems for travel over highways and solid ground, but for movement over marshland a built-in air-cushion system supports three fourths of the weight of the truck. Most air-cushion vehicles, however, are true ground-effect machines, designed for amphibious operation over water, marshy ground, and beaches.

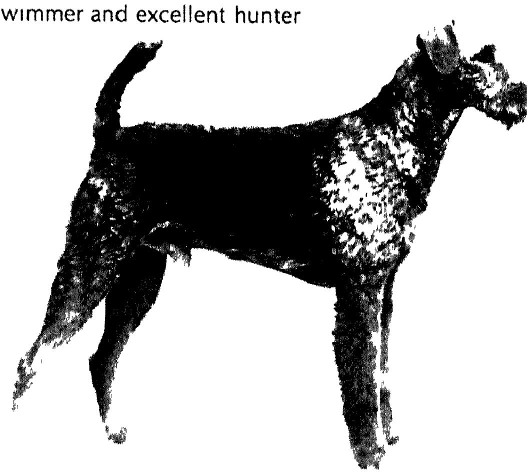
An experimental air-cushion vehicle, designed to run on a track similar to a monorail, reached a speed of 215 m.p.h. on the 4.2-mi. concrete test track in Gometz-la-Ville, France. The so-called aerotrain rode on a cushion of air 1/10 in. thick.

The vehicles have both commercial and military applications, and a number of fifteen- to thirty-passenger craft have been placed in operation around the world. One of the largest air-cushion vehicles currently in use is the 165-ton British SRN 4 hovercraft, *Mountbatten*, which began service in July, 1968. Designed for ferry and passenger service across the English Channel, the craft can carry 30 automobiles and 250 passengers. *See also* HYDROFOIL.

The Jet-Skimmer of Bell Aerosystems, a fifteen-passenger air-cushion vehicle, is shown moving from water to land.

Bell Aerosystems

AIREDALE TERRIER, breed of dogs originating in Yorkshire, England. The airedale weighs 40 to 50 lb. and is the largest of the terrier class. It is wirehaired, with black crown, back, and sides, and tan face, throat, and limbs. The forelegs are straight and the general aspect is trim and powerful. Fast, sagacious, and noted for a keen sense of smell, the airedale also is a natural swimmer and excellent hunter.



Airedale terrier

Trucote Kennels

AIRFOIL. *See* AIRPLANE: *Principles of Flight.*

AIR FORCE ACADEMY, UNITED STATES. *See* UNITED STATES AIR FORCE ACADEMY.

AIR FORCE, DEPARTMENT OF THE, one of the three major components of the Department of Defense of the United States, created by the National Security Act of 1947. The Department is headed by the secretary of the Air Force, who is appointed by the President with the consent of the Senate, and functions under the direction of the secretary of defense. The secretary of the Air Force is responsible for and has authority to conduct all affairs of the Air Force establishment. He is assisted by an undersecretary and three assistant secretaries who act, respectively, in the areas of matériel, financial management, and research and development. They are authorized to act for the secretary of the Air Force on any matters within their respective areas. This authority, subject to the secretary's direction, extends not only to actions within the Air Force establishment but also to actions and relationships involving Congress and other governmental and nongovernmental organizations and individuals.

AIR FORCE, UNITED STATES. See UNITED STATES AIR FORCE.

AIR LAW, body of international and domestic law governing various aspects of civil aviation; *see* AVIATION; INTERNATIONAL LAW. The international law is made up of treaties, conventions, protocols, and other agreements; and the national law, of statutes, rules, regulations, and court-made case law. Agreements concerning activities in space have also been established.

International Law. The importance of modern aviation was recognized during World War II, when a conference was convened in Chicago in 1944 to discuss regulation of postwar international civil aviation. The resulting Chicago Convention of 1944 codified public international air law. Contracting nations adopted international regulations, standards, and procedures for the use of communication systems and air navigation aids; for airport characteristics; for rules of the air and air-traffic control; for airworthiness of aircraft; for licensing of operating and mechanical personnel; for aeronautical maps and charts; for log books; and for measures to facilitate air navigation, for example, expeditious health, immigration, and customs procedures, assistance to aircraft in distress, and investigation of accidents.

The established principle that every nation has complete and exclusive sovereignty over the airspace above its territory was reaffirmed. Every civil aircraft in international aviation must be registered, carry the nationality of the country of registration, and bear appropriate identification markings. The convention granted transit rights (that is, the right to fly over another nation's territory and the right to land there for nontraffic purposes, such as refueling) and permitted nonscheduled flights, such as charter flights and private flights.

A similar arrangement in traffic rights (to pick up and set down passengers, cargo, and mail) was not adopted, and bilateral negotiations had to be carried out to effect such arrangements. The American principle of "freedom of the air" and the British principle of "order in the air" were reconciled in 1946 at Bermuda, at a meeting between the United States and Great Britain. Subsequent bilateral agreements are based on the so-called Bermuda Principles covering the regulation of routes, capacity, and tariff.

Another outcome of the Chicago conference was the International Civil Aviation Organization (q.v.) or I.C.A.O., which was formally established in 1947 as an agency of the United Nations (q.v.) to foster development and promote cooperation in international civil aviation. The organization has a legal committee that is responsible for producing treaties, conventions, and protocols in those areas of air law in which uniformity is desirable.

A basic agreement in international air law is the Warsaw Convention of 1929. This convention provided for presumptive but limited liability of an air carrier for personal injury or death of a passenger and damage to goods in international air carriage. Liability for death or personal injury to a passenger was limited to $8300. The Hague Protocol was adopted in 1955. Constituting a series of amendments to the Warsaw Convention, the protocol doubles the liability limit. The U.S. was not a party to the conference at Warsaw, Poland, that produced the Warsaw Convention, but adhered to it in 1934. By 1969 it had not ratified or adhered to the Hague Protocol. In 1965, indeed, the U.S. gave notice of its intention to denounce the Warsaw Convention because of its low limit of liability. The Americans withdrew this notice, however, when air carriers, under the auspices of the International Air Transport Association (I.A.T.A.), a trade association, agreed to raise this limit to $75,000 with respect to passengers traveling to or from or passing through the U.S. This so-called Montréal Agreement was then incorporated in airline tariffs, which were accepted by the national Civil Aeronautics Board (q.v.) or C.A.B. A new treaty, the Guatemala Protocol to the Warsaw Convention, was enacted. It was signed by the U.S. in 1970 but has yet to be ratified by the U.S. The protocol provides for absolute liability on the part of the airline and an unbreakable limitation of damages to $100,000.

The legal committee of the I.C.A.O., in 1963, produced the Tokyo Convention dealing with offenses committed on board aircraft. It had not become effective by 1969 because it had not been ratified by a sufficient number of members of the U.N. The many aircraft seizures, popularly called hijacking (q v), since 1968, however, brought pressure on the U S government to ratify the treaty, and in May, 1969, the U S. Senate voted its consent to ratification.

National Law. All countries have air legislation designed to conform to the international rules, so that their aircraft do not generally experience problems in complying with the laws of the countries they fly over

In the U S , domestic air law is embodied in the Federal Aviation Act of 1958 and the resulting Federal aviation regulations. The C A B is also responsible for economic regulations governing interstate air traffic States have local rules relating to intrastate aviation activities.

Aircraft noise was the subject of a law enacted by the U.S in 1968, giving the administrator of the Federal Aviation Administration (q v) the authority to set noise limitations for new aircraft and to order noise-reducing equipment for existing aircraft

See also AIRPLANE

Space Law. The flights of unmanned and manned space vehicles that began in 1957 highlighted the necessity for some legal recognition of spacecraft and activities in space. The U.N appointed a Commitee for Peaceful Uses of Outer Space in 1959, and its legal subcommittee produced the Outer Space Treaty of January, 1967 This treaty codified accepted principles of international law relating to outer space and established the proposition that outer space is not subject to national appropriation and is to be used only for peaceful purposes. A treaty of 1968 dealt with the Rescue and Return of Astronauts and Return of Objects Launched into Outer Space This treaty provides for the safe and prompt return to the launching state of any personnel of a spacecraft, any space object, or any component part that lands in the territory of another contracting state as a result of accident or other emergency

In 1971 the U N enacted a space liability treaty providing that the launching country would be absolutely liable to pay compensation for loss of life, injury, or damage to property resulting from objects launched into space by that country *See* ASTRONAUTICS; COMMUNICATIONS SATELLITE

L S K

AIRLINE. *See* AIR TRANSPORT

AIR, LIQUID. *See* CRYOGENICS

AIRMAIL, postal matter transported in aircraft over part of its trip, or the system for so transporting postal matter The first airmail service consisted of a few irregular trips early in 1911 between two English cities within a few miles of London The first authorized United States airmail was flown between Garden City and Jamaica, N Y., in September, 1911. Regular airmail service from London to Paris was begun in 1919 and air parcel post over the same route in 1922 In the U S the first regular airmail route was established between New York City and Washington, D C., in 1918 Transcontinental service, between New York City and San Francisco, began in 1921; the scheduled flying time varied from

Preparation for the first airmail trip from Boston to New York, on June 11, 1918 W F. Murray (left), postmaster of Boston, hands a pouch of mail to pilot Torrey Webb (right) The map Webb used to guide him on his flight is attached to his left knee U S Post Office

twenty-nine to thirty-three hours, but the planes flew only during the daytime. Day-and-night service over the same route was established in 1924. Regular, scheduled, transoceanic airmail was inaugurated in 1935 with service between the U.S. and the Philippines. Before 1935 the *Graf Zeppelin* (*see* AIRSHIP) had carried some mail across the North Atlantic Ocean, and there had been airmail flights across the South Atlantic from Africa to Brazil, but regular airmail flights across the North Atlantic between Europe and the U.S. did not begin until 1939.

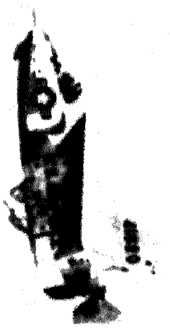
In the meantime international airmail arrangements had been made: some provisions were included in the agreements reached at the International Postal Convention held in Madrid in 1920. A special International Air Mail Conference was held in 1927 at which it was agreed that a uniform cost would be established to enable each country's airmail service to carry airmail of countries with similar service. Lack of agreement concerning the right of the aircraft of one country to fly over the land of another has not affected the amicable workings of the airmail accords.

In 1935 there were about 28,800 mi. of regular airmail routes in the U.S. (excluding service within Alaska), over which approximately 3,400,000 ton-miles of mail were flown, at an average cost to the U.S. Post Office Department of $2.60 per ton-mile. In 1945 there were more than 56,800 mi. of regular domestic routes (excluding Alaskan service), over which approximately 61,500,000 ton-miles were flown at an average cost of 57.3 cents per ton-mile. By 1968 more than 304,000,000 ton-miles of mail were flown.

In 1952 the Post Office Department experimented with shipping a limited amount of first-class mail by air between New York City and Chicago and between Chicago and Washington, D.C. This service was later expanded, according to the amount of unused cargo space available on regular airlines, and in 1975 the Postal Service merged domestic airmail with first-class mail. In 1977 all categories of domestic air-eligible mail transported amounted to 715,631,923 ton-miles at an average cost of 29.5 cents per ton-mile.
L.A.B.

AIRPLANE, heavier-than-air craft that is propelled mechanically and supported by the dynamic action of the airstream on fixed-wing surfaces; *see* AERODYNAMICS. Other types of aircraft that are heavier than air include the glider (q.v.), which is similarly equipped with fixed-wing surfaces but is not self-propelled, and rotary-wing aircraft, which are mechanically driven and supported by overhead rotors; *see* AUTOGIRO; HELICOPTER. Another type of heavier-than-air craft is the ornithopter, which is lifted and propelled by flapping wings. A number of toy-size ornithopters have been developed, but experiments on a man-carrying scale have been unsuccessful. More successful types of heavier-than-air craft include the V.T.O.L. craft, the S.T.O.L. craft, and the convertiplane. The V.T.O.L. (vertical takeoff and landing) craft is an airplane that can rise up vertically, speed off horizontally, and then reverse the procedure for a landing. The term V.T.O.L. is limited to describing aircraft with performances similar to those of conventional airplanes but with additional vertical takeoff and landing ability. Several means are used to lift V.T.O.L. aircraft off the ground. The direct downward thrust of jet engines is used in several designs. But enormous power is needed to lift a craft in this manner, much more than is required to propel it horizontally. Rotating wings

In a spectacular vertical takeoff, the X-13 Vertijet soars straight up on a column of exhaust gases from its jet engine. The U.S. Air Force Vertical Takeoff and Landing airplane, built by the Ryan Aeronautical Company, depends solely upon thrust from its powerful engine for both its takeoff and landings.
UPI



The McDonnell-Douglas Turboprop Steep Takeoff and Landing airplane is a commercial transport having the highly useful capability of operating from runways of limited length UPI

and ducted fans are also used for direct lift, but they tend to introduce drag into the horizontal flight Convertiplanes, combining the rotating wings of helicopters with the fixed wings of airplanes, show promise for short-distance commercial V.T.O.L. operation However, they compete directly with helicopters.

The S.T.O.L. (short takeoff and landing) craft is an airplane that takes off and lands very steeply, thus requiring little runway. For a given payload, it is much more efficient in terms of fuel consumption and power requirements than a V.T.O.L. craft. It is also capable of higher speeds and longer-range flights than a helicopter. For lighter-than-air craft, see AIRSHIP; BALLOON

The term "airplane" generally denotes the landplane, but it applies also to several other categories of aircraft, including the carrier-based plane, the seaplane, and the amphibian. The principal variation in structure is to be found in the landing apparatus. The carrier-based plane, a type of landplane designed for use on an aircraft carrier (q.v.), is fitted with a tail hook that engages a cable stretched across the deck to arrest the plane after landing. The seaplane employs pontoons instead of the wheel gear of the landplane In the variety of seaplane known as the flying boat, the fuselage is constructed as a hull, similar to that of a seagoing vessel, and serves to keep the plane buoyant. The amphibian is equipped with both wheel gear and hull or pontoons to permit operation on land and water.

Prior to World War II flying boats were used for military transports and for intercontinental commercial service These planes were limited to low flying speeds, and to low landing speeds in water With the advent of planes that fly and land much faster, large planes have been limited to land-based operation. The amphibian, even slower because of its double undercarriage, is less commonly employed than the landplane For light sportplanes, amphibious floats have recently been made available Generally resembling conventional pontoons, they have a recessed wheel located at the center of balance of the seaplane, the wheel-well is waterproof. The wheel tire does not extend far enough to add much drag to the float in the water, but it is of sufficient diameter and protrudes far enough to enable wheeled landings to be made on hard-surfaced runways or short-cut grass

Principles of Flight. For an airplane in level flight, two sets of opposing forces must be balanced The gravity force, which results from the weight of the plane, must be balanced by the lift that is developed primarily by the wings and, to a smaller extent, by the fuselage. The drag, which is the resistance of the air to the forward motion of the plane must be overcome by the thrust produced by the propellers or by jet engines. For takeoff and climbing the lift must exceed the weight; for acceleration the thrust must exceed the drag.

PRINCIPLES OF FLIGHT DIAGRAM OF AN AIRFOIL

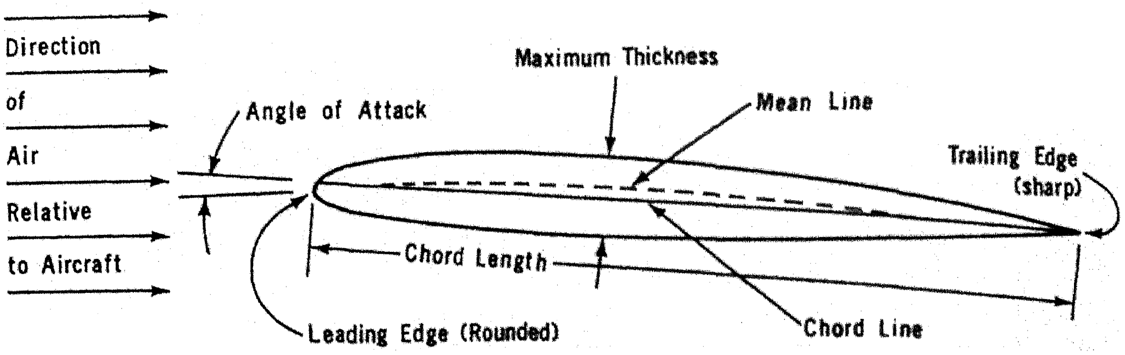


Fig. 1. The distance between the skeletal mean line and the chord line defines the camber of the airfoil.

Fig. 2 (left). Airfoil in normal flight. Fig. 3 (right). Airfoil with flap depressed to produce high lift at low speeds.

Lift is produced by the nonuniform pressure distribution about the wings which, as a consequence of Bernoulli's principle (q.v.), will have a lower pressure on the top surface than on the bottom surface. For a plane flying at a given angle of attack, or a fixed attitude of the wing relative to the oncoming air, the lift increases approximately as the square of the flight velocity as long as the flight speed is well below the speed of sound (approximately 760 m.p.h. at sea level). The lift also varies approximately linearly with the angle of attack. Because the lift must always equal the weight for level flight, the angle of attack must be increased as the speed is reduced and at the low landing or take-off speeds, the lift will have to be augmented by auxiliary lift-producing devices such as flaps.

For optimum flight conditions the drag should be minimized, and the lift should be at a maximum. A well-designed airfoil with a high lift-to-drag ratio has a thin teardrop shaped section with a maximum thickness-to-chord ratio of from 6 to 15 percent and with maximum thickness of the airfoil occurring between 25 and 40 percent of the length of the chord from the leading edge. In addition, the airfoil is normally slightly cambered; a central skeletal mean line through the airfoil will have a slight upward bulge.

See Fig. 1, 2, and 3. *See also* FLIGHT, THEORY OF; PROBLEMS OF SUPERSONIC FLIGHT. The supersonic age that aviation entered after World War II presented a number of new problems so revolutionary that aerodynamicists found themselves resorting to experimentation as dangerous and adventuresome as any faced by early airmen; see AVIATION. Neither complex mathematical analyses nor improvement of such research tools as the wind tunnel (q.v.), in which models of airplanes are tested, could insure completely satisfactory performance of an aircraft under the conditions encountered in supersonic flight.

The first formidable problem confronting the aerodynamicist is that arising when the plane attains the speed of sound, known popularly as the sound barrier and scientifically as Mach 1. An airplane about to break the sound barrier is on the verge of catching up with the pressure waves created by its own forward thrust. The resulting distortion of the airflow at Mach 1 causes the formation of a shock wave, known as the compressibility shock, which greatly increases the drag of the plane. If the craft is not *properly designed to cope with this abrupt* change in the nature of the airflow, its control will be severely if not disastrously impaired. *See* SOUND; SUPERSONICS.

Among other serious problems associated with supersonic flight is the high temperature caused by the *friction of the air* against the outer surfaces of the airplane. This problem is known as the heat barrier. To withstand the extremely high temperatures and pressures generated at supersonic speed, the structural materials must be far more resistant to heat than the aluminum alloys used for subsonic aircraft Titanium (q v) is an example of the type of heat-resistant, high-strength metal required in supersonic aircraft The demands of the supersonic age for higher speeds, higher altitudes, and longer ranges have led not only to new aerodynamic designs, but also to research for new structural materials *See also Development,* below

Airplane Structure. The present-day conventional airplane may be divided into four components fuselage, wings, tail assembly, and landing gear, or undercarriage To these may be added the propulsion and control components, *see Flight Control* and *Propulsion,* below

FUSELAGE In the early days of aviation, the fuselage was merely an open structural mount to support the other components of the plane, and the bottom of the airframe served as the landing gear Subsequently, the need for greater strength and better performance resulted in the development of enclosed, boxlike, "strut-and-wire" fuselages that not only increased lift and decreased drag but also provided protection for pilot and passenger, as well as space for cargo. This type of structure, known as truss, was gradually superseded by the monocoque (literally "single shell") fuselage The loads imposed on such a structure are carried primarily by the skin, rather than by the internal framework, as in the trussed structure. In varying stages of advanced design, it is the most common fuselage presently in use.

WINGS Although the single-winged plane, known as the monoplane, made its appearance in the first decade of powered flight, early airplane construction favored the use of two wings (the biplane), and occasionally even three or four. Multiple-wing planes have the advantage of superior lift, but the monoplane was subject to less drag. Once the cantilever (q.v.) principle of wing construction was developed, the dominance of the monoplane was assured, although it did not become the design of choice until the 1930's. Cantilever wings obtain their entire strength from structural elements inside the skin. In present-day aircraft, cantilever construction is employed in large aircraft, and external bracing is used only for small, light planes.

The structure of a typical wing consists of a spar-and-rib framework enclosed by a thin covering of metal sheet, of treated fabric, or, infrequently, of bonded plywood or of resin-impregnated glass fiber. The spar, or beam, extends from the fuselage to the wing tip. One or more spars may be used in the wing, but the single spar is the preferred design The ribs, at right angles to the spar, give the wing its external shape If the covering is of metal sheet, it contributes its own share of strength to the wing This "stressed skin" type of wing is currently used in all large planes, fabric covering is employed for the wings of some small craft

The size and shape of wings vary widely, depending on specific aerodynamic considerations. Wings of many supersonic planes have a high degree of sweepback (arrowhead tapering from the nose of the plane) and are as thin as possible, with a knifelike leading edge Such streamlining helps to reduce the compressibility shock when the plane approaches the speed of sound That the wing is the most important structural member of the airplane is dramatically demonstrated by the development of the so-called flying wing, a craft in which fuselage and tail are almost entirely eliminated. For speeds beyond the sound barrier, the nontapered wing is often the most efficient

TAIL ASSEMBLY The conventional type of tail assembly consists of two basic surfaces, horizontal and vertical, each of which has movable sections contributing to control of the craft and fixed sections to provide stability The leading section of the horizontal surface is known as the horizontal stabilizer, and the rear movable section, as the elevator. The stationary section of the vertical surface is called the fin, and the movable section, the rudder Two vertical surfaces are used in some aircraft; in that case a double rudder is used. The V-shaped tail combines the rudder and elevator functions in a single device Tails vary in size according to the type of aircraft, but in supersonic flight the tail should be as small as possible, and its complete elimination would be the ideal design

LANDING GEAR Present-day landing gear is one of the most intricate of all aeronautical mechanisms. Its components include the oleo strut, a hydraulic arm connecting the wheel with the wing or fuselage, absorbing the shock of landing; the retracting mechanism, which raises and lowers the gear, the wheels, and the wheel brakes. A number of types of undercarriage are known, but two are most commonly employed the conventional two-wheel gear and the tricycle gear. The former consists of two large wheels located forward of the center of gravity of the plane with a small wheel at the tail. A tricycle gear consists of two large wheels behind the center of gravity and a third wheel, called the nosewheel, in front of the two main wheels. Landing is easier with the tricycle gear because braking and maneuvering are improved and the danger of nosing over is diminished. Other forms of landing gear include a caterpillar tread for handling heavy loads on poor landing fields, a swiveling gear for landing in crosswinds, and a combination ski-wheel gear for use on ice and snow.

Flight Control. The attitude of an airplane is determined by three control devices, each of which provides for movement about a different axis. The three include the movable sections of the tail, which are the elevators and rudders; and the movable sections of the trailing (aft) edge of the wing, known as ailerons. The control surfaces are operated from the cockpit by means of a control stick and rudder pedals or by a wheel on a column and rudder pedals. Stick control is used in smaller, lighter airplanes, and the wheel, with its greater leverage, is used in larger airplanes.

Elevators provide for pitching movement around the lateral axis. A backward pull on the control stick or wheel column raises the elevators, thereby depressing the tail and lifting the nose of the plane for a climb. Forward movement of the stick or column produces the opposite effect, making the plane dive.

Ailerons, usually placed far out on the wing, control rolling movement around the longitudinal axis. Leftward movement of the stick or turn of the wheel raises the left aileron and lowers the right, thereby banking the plane to the left. The reverse tilt occurs when the stick is pushed or the wheel turned to the right.

Rudders provide for turning movement around the vertical axis, changing the course of the plane to the left or the right. When the right rudder pedal is pressed, the rudder turns the plane to the right around the vertical axis. Pressing the left pedal produces a left turn.

To insure easier and more dependable handling of all control surfaces, a number of secondary controls have been devised. Trim tabs are used on rudders, elevators, and ailerons as a means of adjusting the equilibrium, or trim, of the plane. Other controls include flaps (on trailing edges) and slots (on leading edges) to increase lift for takeoff or drag for landing, or to improve various other flight characteristics. Spoilers are surfaces that normally lie flush with the wing but can be raised to present a flat surface to the airstream and "spoil" the lift of the wing. Somewhat similar surfaces are called air brakes and extend at right angles to the fuselage or undersurface of the wing to slow the speed of the plane.

Airplane Instruments. Information required in flight is provided by various types of equipment, which may be divided into four general categories: power-plant instruments, flight instruments, landing instruments, and navigational aids (see RADIO AIDS TO NAVIGATION). Power-plant instruments indicate whether the engines are functioning properly and include the tachometer, which shows the revolutions per minute of each engine, various pressure gauges, temperature indicators, and the fuel gauges. The primary flight instruments provide indications of speed (the air-speed indicator), direction (the magnetic compass and the directional gyro), altitude (the altimeter), and attitude (the rate-of-climb and turn-and-bank indicators and the gyro horizon). Several of the flight instruments, including the automatic pilot, utilize the gyroscopic principle; see GYROSCOPE.

Landing instruments needed in poor visibility are of two types, the instrument-landing system (I.L.S.), providing direct signals to the pilot to enable him to make a safe landing, and the ground-controlled approach (G.C.A.), a system employing radar (q.v.) equipment on the ground to guide the pilot solely by radiotelephonic advice. The I.L.S. is widely used in civil aviation, the G.C.A. system, in military aviation. Both systems may also use the standard approach lighting system (A.L.S.), which guides the airplane the last few hundred feet to runway. *See also* AIRPORT; AIRWAY.

Propulsion. Two basic means are used to provide the thrust for an airplane in flight, propeller or jet propulsion (qq.v.). In a propeller-driven airplane either a piston-driven internal-combustion engine (q.v.) or a turboprop engine is utilized to drive the propeller that thrusts the air backwards by having airfoil-shaped blade sections cutting through the air in a screwlike fashion. In jet propulsion, the forward thrust is provided by the discharge of high-speed gases through a rearward-facing nozzle.

An aircraft engine must satisfy a number of major design requirements, including high reliability, long life, low weight, low fuel consumption, and low frontal area. The most important factor is reliability. Long life is mainly an economic consideration, of special interest in commercial aviation. The relative importance of the other three requirements depends upon the type of plane that the engine is intended to propel. Low weight and low fuel consumption are naturally interdependent because the fuel itself is a weight factor. Low frontal area is desirable as a means of reducing to a minimum the drag caused by the engine.

The internal-combustion engine used in most propeller-driven aircraft is one of two types, the reciprocating engine and the compound engine In the reciprocating engine, heat energy is utilized to move pistons operating within cylinders Cylinder arrangement is generally in-line, horizontal-opposed, or radial, and either air-cooling or liquid-cooling systems are used Nearly all aircraft reciprocating engines are gasoline operated In general, the advantages of the reciprocating engine are reliability and fuel economy

The compound engine consists of a reciprocating engine combined with an exhaust-gas turbine (q.v) that drives a super-charger The chief advantage of the compound engine over the reciprocating engine is its high-power capacity at high altitudes The compound engine served as the chief engine in U S military aircraft during World War II, before the advent of jet propulsion.

Nonreciprocating aircraft engines, all of which operate on the principle of jet propulsion include the turbojet, the turboprop, the ramjet, and the rocket engine. The turboprop, turbojet, and turbofan engines, which are a modification of the turbojet engines, are gas turbines (q.v.), where air is first compressed in a compressor. Fuel is then added to burn the oxygen in the air, increasing the gas temperature and its volume. The high pressure gases are then partially expanded through a turbine which drives the compressor (and the propeller in a turboprop engine). The residual gas, that is now at an intermediate pressure is accelerated by expansion through a rearward facing nozzle, to produce a high leaving velocity and, with it, the desired thrust. Turboprop engines are efficient for medium-sized planes at speeds up to about 300 to 400 m.p.h. At higher speeds, turbojet or turbofan engines give better performance At speeds above about 500 m.p.h. the performance of a propeller becomes so inefficient that propellers are discarded as propulsion devices in favor of jet engines.

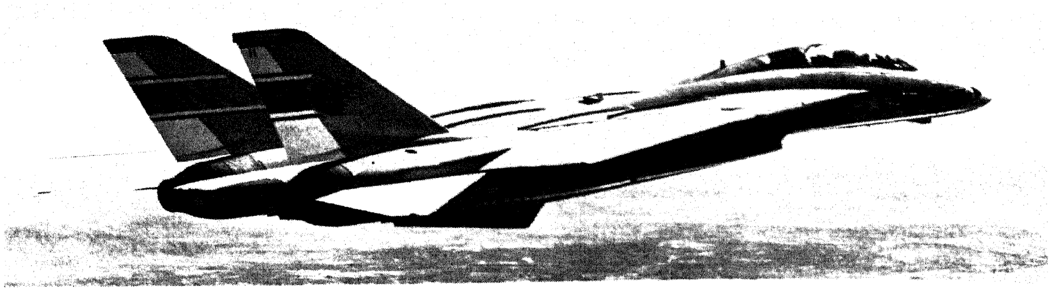
The ramjet engine is an internal-combustion engine, in which the air compression needed for combustion is obtained from the speed of forward motion alone. As in the turbojet, its total power output is delivered as the jet thrust of its expelled gases. Although the ramjet can be applied to piloted aircraft, its present rate of fuel consumption is so prohibitively high that it is used only in guided-missile applications; *see* GUIDED MISSILES

Like the ramjet, the rocket engine has its chief application in guided missiles. In aircraft it is used primarily for jet-assisted take-off (JATO), as supplementary initial power. However, rocket engines for piloted aircraft are in the developmental stage and have appeared in several experimental models *See* ROCKET

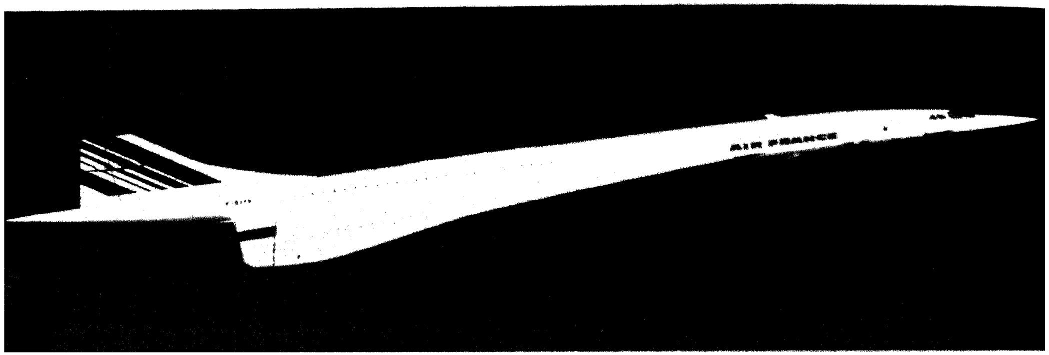
NOISE POLLUTION A major problem confronting the designers of supersonic aircraft is that of noise Engine noise of supersonic transports is louder and more high-pitched than that of subsonic jets, already a serious annoyance to airfield workers and residents of communities near airports Medical concern, moreover, has been expressed about the effect of sonic booms, which are produced each time a supersonic plane exceeds the speed of sound As an aircraft flies, the air rushing toward the plane should be deflected smoothly about the wing and in subsonic flight this does take place As supersonic speeds are reached, however, the airflow can no longer adjust itself well ahead of the wing since disturbance signals "warning" the air cannot move faster than the speed of sound As a result, the air has to adjust itself suddenly in the proximity of the leading edge of the wing by a sudden pressure rise or shock coupled with a redirection of the flow The resulting shock front which travels with the aircraft extends over large vertical distances and reaches the ground with an impact which sounds like an explosion even if a plane flies at maximum altitudes The shock wave may be so severe that it can break windows on the ground far beneath the plane Attempts were being made in the middle 1970's by designers, manufacturers and investigators of various government agencies, including the Federal Aviation Administration (q.v.) to curb both engine noise and sonic booms.

Airplane Types and Uses. Airplanes may be categorized according to their function and field of operation into three main types (1) commercial aircraft, including those for transportation of passengers and cargo by scheduled and nonscheduled air lines, (2) military aircraft, and (3) utility or general aircraft, which include all types of airplanes not included in the other two. The particular characteristics of each plane are determined by the nature of the services to be performed. Increasing specialization in usage has resulted in wide variation in design requirements

COMMERCIAL AIRPLANES Although the airplane was adopted for passenger-transport service in Europe by 1919, it was not fully accepted as a common carrier in the U.S. until some years later, the carriage of mail by the U.S. Post Office Department, however, laid the foundation in the years from 1918 to 1927 for domestic airline

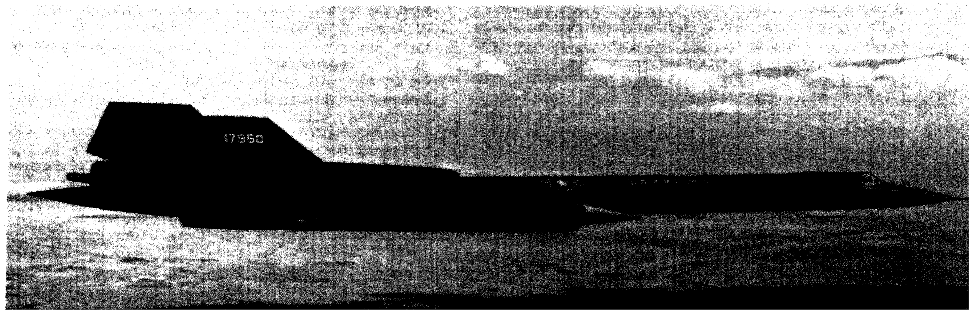


The supersonic swing-wing F-14 Tomcat, seen here in flight off San Diego, Calif., is a carrier-based fighter. The twin-engine airplane carries air-to-air missiles and has a combat ceiling in excess of 55,000 ft. U.S. Navy



A Concorde (above) during takeoff. The delta-winged S.S.T., developed jointly by France and Great Britain, carries 132 passengers at more than twice the speed of sound, but its noise level has made it highly controversial. The strategic reconnaissance "Black Bird" SR-71 spy plane (below) flew from New York City to Farnborough, England, in 1 hr. 56 min. on Sept. 11, 1974, breaking the transatlantic air speed record. During parts of the flight, the SR-71 exceeded 2000 m.p.h.

Air France (above) U.S. Air Force (below)



service The typical passenger aircraft evolved from two-engine propeller planes such as the DC-3, which carried 21 passengers and cruised at 190 m.p h., to the powerful four-engine planes of the 1950's, which could carry up to 100 passengers at speeds of over 300 m p h. By the mid-1970's, U.S airlines were carrying about 246,000,000 passengers per year on domestic and international routes

Different types of passenger planes are used depending on two factors. the volume of traffic and the distance between airports The distance between airports is known as the stage length. The greatest number and variety of planes can operate profitably over stage lengths between 250 and 1000 mi

Commercial passenger jets were first used on long-distance runs; the British DeHavilland Comet began service in 1952, and the Boeing 707 in 1958. Also developed in the late 1950's were the DC-8 and the Convair 880 and 990. These planes cruised at about 550 m.p.h. and carried over 100 passengers.

Smaller jets such as the French Caravelle and the Boeing 727, both of which used a design with engines in the tail, were built for medium-distance runs of from 500 to 1500 mi In the mid-1960's, even smaller two-engine jets were built to operate on short runs. These include the Boeing 737, the DC-9, and the Fokker F-28

The Boeing 747, which made its first flight in 1970, was the first of the wide-bodied planes that now serve on high-density medium and long-distance runs. The 747 employs four turbofan engines that develop 45,000 lb. of thrust apiece, and flies at over 550 m.p.h. It usually is fitted for 385 passengers, but can accommodate 500 seated 10-abreast.

The DC-10 and the Lockheed 1011 "Tristar" are each capable of carrying more than 300 passengers. Both use a three-engines-aft design; they were built for Chicago-Los Angeles flights and comparable stage lengths. The DC-10 first flew in 1971, and the L-1011 in 1972.

The most technologically advanced passenger aircraft is the supersonic transport or SST, a plane capable of flying back and forth across the North Atlantic in less time than it takes an ordinary jet to fly across one way. The Soviet TU-144 was the first of these planes to be put in service It began making scheduled freight hauls within the Soviet Union in 1975.

The British and French governments signed an agreement in 1962 to build the supersonic Concorde; the first test model flew in 1971. A certificate of airworthiness was granted in 1975, and the first commercial flights were made on Jan. 21, 1976 The French plane flew between Paris, Dakar, and Rio de Janeiro, and the British from London to Bahrain

From its inception the SST had been criticized for being uneconomical and excessively noisy Despite such objections, service to the U S was commenced on May 24, 1976, with simultaneous flights from London and Paris to Dulles International Airport near Washington, D C. But the Port Authority of New York refused to allow the Concorde to land at Kennedy International Airport, pending evaluation of the plane's performance at Dulles International Airport It was only after the British and French won a lengthy battle in the courts that the plane began service to New York on Nov 22, 1977.

The future of the SST was still not assured by the late 1970's Operating losses on the Concorde were in excess of $1 billion, and production of the plane was scheduled to stop in 1978 The French plane had extended service to Caracas, Venezuela, from Paris, but other new routes were still in the negotiating stage

The air-freight business has enjoyed an unprecedented boom since World War II. Leading commercial cargo planes include the Canadair CL-44 and the A-W Argosy, in addition to specially modified versions of the larger passenger jets.

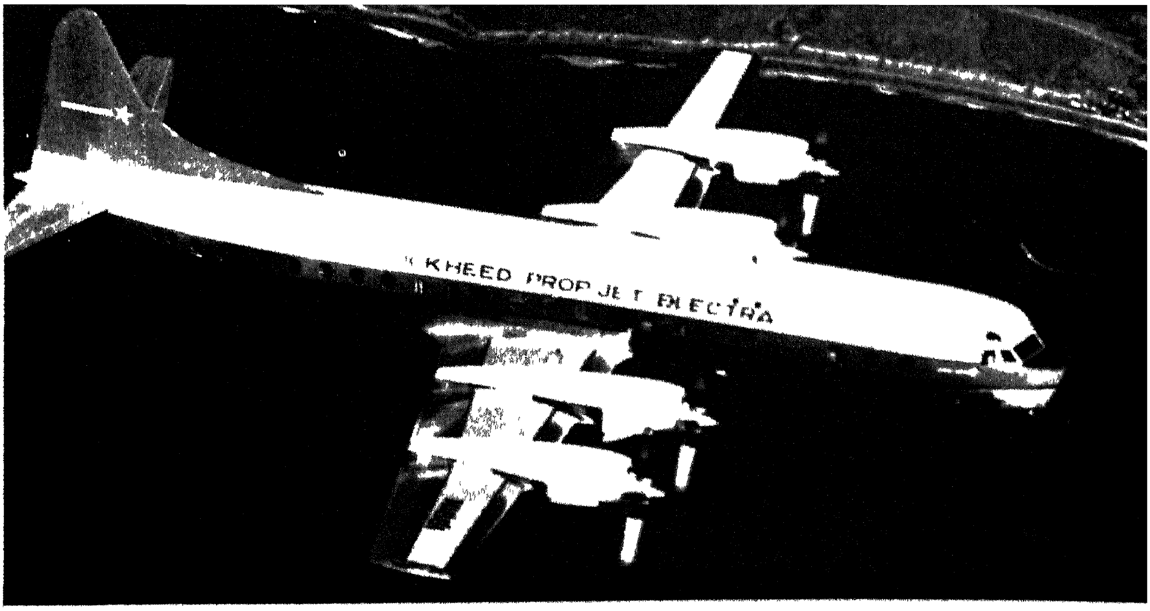
MILITARY AIRPLANES. Military planes of the U S may be divided into four categories combat, cargo, training, and observation planes. Combat planes comprise fighters and bombers for land, sea, and carrier operations.

The F-4 Phantom aircraft, used by both the U S. Navy and the U S. Air Force, is a supersonic, missile-firing tactical bomber that can also deliver small nuclear weapons It can be equipped with "smart" bombs that are guided to their targets by laser beams; *see* BOMB.

The F-111 is a jet fighter capable of flying at more than twice the speed of sound; a somewhat larger version of the plane is used as a bomber New aircraft under development are the F-15, which excels at air-to-air defense tactics; the F-16, an all-purpose fighter, and the A-10, an attack plane designed for use in close support of troops on the ground.

Aside from the F-4, the principal carrier-based aircraft in use by the U.S Navy are the F-14 Tomcat, a swing-wing supersonic jet, and the A-6, an attack bomber.

The B-52 Stratofortress, a subsonic plane first developed in the 1950's, is the principal long-range heavy bomber used by the U.S. Air Force. As part of the Strategic Air Command (SAC), it is capable of delivering nuclear weapons to any



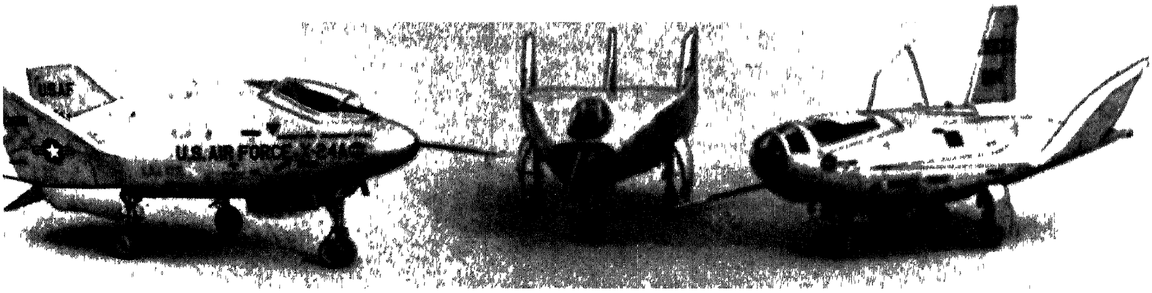
UPI

The Lockheed Electra, a turboprop commercial transport, served U.S. airlines during the mid 1950's before the arrival of jet-propelled aircraft. The Electra carried up to 98 passengers at a top speed of 450 m.p.h.

McDonnell Douglas Corporation

The three engine McDonnell Douglas DC-10 airbus (above), which went into service in 1971, can carry up to 380 passengers. It has a range of 4500 mi. and a cruising speed of about 600 m.p.h. These experimental lifting bodies (below), the X-24A, M2-F3 and HL-10, being developed in the mid 1970's, marked the transition from air transport to possible future passenger space flights. The joint U.S. Air Force-NASA space shuttle program is aimed at developing a manned spacecraft that could land like a conventional aircraft.

NASA



part of the globe Its principal use in actual combat was during the Vietnam War, when it was employed in "carpetbombing" missions against concentrations of enemy forces

The jumbo Air Force C-5A cargo airplane, which came into use in the early 1970's, is the largest and heaviest winged aircraft in the world It can rush 132 tons of troops and equipment over a distance of 5000 mi without refueling, and to any part of the world with in-flight refueling In 1974 an intercontinental ballistic missile was successfully test-launched from the giant C-5A

All branches of the service are currently equipped with jet training planes Observation planes are designed largely to facilitate aerial photography; see AERIAL SURVEY

GENERAL AVIATION Planes used for private pleasure, for business, for agricultural or other special services, or for flight instruction may be termed utility, or general aviation craft The most widespread use of special-service airplanes is in agriculture Agricultural applications include dusting and spraying with insecticides and herbicides, fertilizing, and seeding Aerial inspection of pipe and power lines is an important industrial application. Other uses of special-service aircraft include mapping and survey, forestry patrol, aerial photography, and game- and predatory-animal control Airplanes were formerly used for policing and rescue operations, but the helicopter has proved more suitable for much of such work

Development. During the 19th century many attempts were made to construct flying machines, but the successful efforts were confined to unpiloted scale models. For the early history of heavier-than air craft, see AVIATION For the contributions of eminent designers and inventors, see articles on such individuals as Samuel Pierpont Langley, Orville Wright and Wilbur Wright, and others

Interest in aviation soared in the first decades of the 20th century, and one design elaboration followed rapidly after another The first successful seaplane, a French design, flew in 1910. Airplane production increased considerably during World War I, when the military implications were recognized. After the war, airlines were initiated, and a few years after the famous flight of the American aviator Charles Augustus Lindbergh (q v.) to Paris in 1927, airline service girdled most of the globe.

Rapid as these developments were, none could compare with the changes brought about at the close of World War II by jet propulsion The sound barrier was first broken in 1947 by then Captain Charles E Yeager (1923–) of the U S Air Force, piloting the Bell X-1 Another experimental craft, the North American X-15, had climbed 354,200 ft into the stratosphere and reached speeds in excess of 4500 m p h , when the U S X-15 Flight Research Program was completed in 1968 The nonstop range of large planes is measured in many thousands of miles and has been prolonged by refueling in midair Vertical takeoff of fixed-wing aircraft is a reality A revolutionary craft, known popularly as the flying platform and capable of both horizontal and vertical flight, was demonstrated in 1955 Extremely simple to operate, the craft obtained both lift and propulsion through a set of contrarotating propellers, which sucked air through holes in the frame

One of the most advanced aircraft built by the U.S in the early 1960's is the strategic reconnaissance SR-71 "Black Bird", first revealed to the public late in 1974 A special titanium alloy was developed for the skin, which could withstand pressures of up to 200,000 lb per sq in at speeds estimated in excess of 2500 m p.h and at altitudes of about 120,000 ft Equipped with powerful cameras, infrared sensors, and radio recorders, the SR-71's were believed to be employed in monitoring military activities along the Soviet and Chinese borders

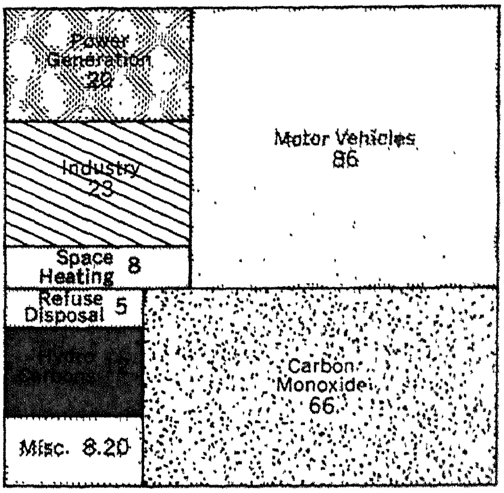
L A.B

AIRPLANE CARRIER. *See* AIRCRAFT CARRIER

AIR POLLUTION, contamination of the atmosphere by substances harmful to health. The contaminants may derive from natural sources, such as plant pollens or dust from open land However, most of the pollutants consist of the exhausts and waste created by motor vehicles, incinerators, and heating and electric-power systems Another important and dangerous source of air pollution is radioactive fallout.

Between 2,000,000,000 and 3,000,000,000 tons of dirt and gaseous wastes drift into the atmosphere each year in the U.S. About half the pollutants on the earth originate in 1 percent of the land area, which is occupied by 50 percent of the population If wind, temperature, and other meteorological factors do not permit the polluting materials to disperse, respiratory and circulatory complaints among the population may be expected to increase sharply

The polluted air is often trapped by a phenomenon known as temperature inversion. Ordinarily, warm air from the ground rises into the cooler air above But if a layer of warmer air forms above the air near the ground, or the air near the ground cools more rapidly than the air above it, the pollutants are trapped at ground



Major Sources of Air Pollution in the U.S. in millions of tons per year in the early 1970's

level by the inversion. An inversion is most likely to occur over a river valley or along a mountain barrier.

It is now established that air pollution contributes to an excess rate of death, chiefly among persons susceptible to the deleterious effects of air pollutants. For example, an inversion at Donora, Pa., in 1948 was found to have caused the deaths of twenty-two persons and respiratory illnesses in more than 6000 persons. Other such catastrophes include 62 deaths in the Meuse R. valley in Belgium in 1930; 4000 in London, England, in 1952; and 400 in New York City in 1953.

The Gateway Arch in Saint Louis, Mo., shrouded in smog UPI

Although the term smog (q.v.) originally was intended to identify a mixture of smoke and fog, it is commonly used to describe any body of polluted air that may be a hazard to human health. Such hazards may range from simple irritation of the eyes to serious aggravation of respiratory and circulatory disorders. Researchers at the California Institute of Technology reproduced smog in the laboratory. The smog was created by exposing gasoline vapors and exhaust fumes to sunlight, demonstrating the role of the gasoline engine in air pollution. The research also showed that fumes trapped near the ground by an inversion layer are converted by energy from the sun into other noxious chemicals which contribute to air pollution.

The west to east patterns of winds over North America play a role in the distribution of pollutants. Rather than disperse the particles, the winds may push them from one populated area to another. The heavier particles may drop to earth along the route of the moving air mass, but other pollutants may be added as the air mass moves in the direction of the Atlantic seaboard.

Some of the gases that contribute to air pollution include sulfur dioxide, sulfur oxide, nitrogen dioxide, and carbon monoxide. Much of the sulfur dioxide discharged into the atmosphere results from burning coal. Nearly half the coal used in the U.S. is consumed in the production of electricity. Some 50,000 tons of sulfur dioxide are discharged into the air daily in the process of burning coal. A primary source of carbon monoxide and the nitrogen oxides is the automobile; some 100,000,000 motor vehicles are registered in the U.S.

In addition to the harm done to humans, air pollutants affect food crops. Fluoride compounds given off as a result of certain manufacturing processes have been found to retard the growth of oranges, grapefruits, and other citrus fruits.

In 1967 the U.S. Congress enacted the Air Quality Act, which significantly strengthened Federal and State powers to control air pollution. The law authorized the Department of

Health, Education, and Welfare to spend $428,000,000 over a three-year period for expansion of Federal air-pollution control programs and for research and development of pollution-control devices. The law allows each State to determine its own air-quality standards, but entitles Federal authorities to establish controls should a State fail to act.

In 1970 the U.S. Congress passed the so-called Clean Air Act that made it imperative for automobile manufacturers to design engines that would eliminate 90 percent of the exhaust pollutants by 1975. To meet the petroleum shortage in the early 1970's, however, the deadline was moved back two years so that the automobile industry could design more efficient engines. Late in 1974, the manufacturers asked for a freeze on Federal automobile-emission standards until 1980, and in January, 1975, President Gerald R. Ford (q.v.) expressed his support for such an extension. Environmentalists maintained, nonetheless, that "cleaner" engines could, with a more determined effort, be speedily designed and were preparing to fight the issue in the U.S. Congress.

See also WATER POLLUTION.

AIRPORT, terminal for landing and taking off of aircraft, with facilities and equipment for handling passengers and cargo, and for servicing aircraft. Large airports usually include the necessary facilities for aiding the operation of aircraft under both Instrument Flight Rules (I.F.R., when visibility is so restricted that landings and takeoffs cannot be made visually), and Visual Flight Rules (V.F.R., when the weather permits safe flying by visual reference to the ground). *See* AIRPLANE; AVIATION.

Airports, like other transportation terminals, have economic and social value; cities and towns are linked to the rest of the air-transportation system by the airports. In the early 1970's more than 12,000 airports were operational in the United States, about 600 of them served by the regularly scheduled airlines. The Federal Aviation Administration (q.v.), or the F.A.A., which regulates the aviation industry for safety and operates the national public-air navigation system (*see* AIRWAY) and air-traffic control system, anticipated an urgent need for several hundred additional airports, including heliports and seaplane bases. By the late 1970's, the F.A.A. anticipated a commercial, business, and private air fleet of more than 175,000 aircraft, with about 260,000,000 paying passengers. In the early 1970's these figures were about 167,000 and 202,000,000, respectively.

About one third of U.S. airports are publicly owned and the rest are private, although many of the privately owned airports are open to public use as a business enterprise. They are operated by individuals, corporations, special commissions, terminal companies, or independent airport authorities. The Federal government owns and operates only two of the publicly owned airports, the Washington National Airport and Dulles International Airport in suburban Virginia, which are operated by the F.A.A.

In 1947 the Federal government began to encourage the construction of new airports and the improvement of existing airports with matching grants. The Federal Aid-Airport Program (F.A.A.P.) is administered by the F.A.A., and only publicly owned airports are eligible for F.A.A.P. assistance.

Facilities. Airport buildings are grouped under two broad headings, specifically, administration-area buildings and hangars. An administration or terminal building often includes offices and space for concessions, weather-bureau facilities, traffic-control personnel offices, restaurants, hotels, and airline ticket offices. In the administration-building area are the aircraft-parking zones, airplane-servicing facilities, and automobile-parking lots.

Airport hangars are of two general varieties: large, multipurpose hangars capable of housing several aircraft, and small, T-shaped hangars for only one aircraft. Large hangars are often used as maintenance shops, and for storage of airplanes.

Airports used exclusively by helicopters are called heliports; see HELICOPTER. Seaplane bases serve aircraft that can land on and take off from water. Airports operated by the military services are referred to as naval air stations, army airfields, and air force bases.

The arrival of the long-range commercial jetliners in the late 1950's required extension of existing airport runways. The best airfields in the U.S. provide at least one 10,000-ft. runway, and a few of the best equipped, such as O'Hare International, Chicago, Ill., and Dulles International near Washington, D.C., have parallel 10,000-ft. runways for increased capacity. Longer runways are not believed to be needed; the so-called jumbo jets, such as the Boeing 747, and the airbuses, such as the Lockheed 1011 and McDonnell-Douglas DC-10, are expected to use existing runways. The increased weight of the jumbo jets, however, requires extensive strengthening of runways; the takeoff weight of the Boeing 747 may be over 700,000 lb. The supersonic transports (S.S.T.) are being designed to operate from facilities at the largest airports.

Problems of Air Traffic. By the early 1970's, the growth in air traffic had generated major national problems in expediting the flights of commercial and business and pleasure aircraft at the major terminals. Lengthy delays had become commonplace during peak traffic periods, and the airlines had been forced to adjust some of their flight schedules as a temporary expedient. The long-range plan for automation of the traffic-control system, expected to provide some relief, was well under way in en route control centers operated by the F.A.A. and had started in the control towers, but a serious shortage of adequate airports remained.

Noise Control. A major deterrent to the construction of new airports in the 1970's was objection to aircraft noise. Existing airports, especially after the introduction of jet aircraft, were besieged with complaints. Proposed new airport projects, in many locations, were greatly delayed, as was the fourth major jetport for the New York metropolitan complex, or cancelled. Scientific measurements showed little increase in the total noise output of jet aircraft compared with the immediately preceding piston and turboprop aircraft, but the annoyance factor of jet noise was apparently greater. To minimize disturbance to those on the ground, all flights departing from large airports in congested areas, such as John F. Kennedy International in New York City and Washington National, were required to reduce power and rate of climb after takeoff until the populated area was cleared, or to bypass highly populated areas.

Some relief from jet-engine noise was in sight at the beginning of the 1970's, as engineers looked forward to a reduction of about 20 percent with improved engine design and insulation, but the ultimate solution appeared to be better airport land-use planning for those airports yet to be built. The supersonic transports, expected to be flying in regular service by the middle 1970's, were no noisier during landing and takeoff than the subsonic jets; *see* AIRPLANE: *Propulsion;* SUPERSONICS.

Short-Distance Flights. It has been suggested that short takeoff and landing (S.T.O.L.) aircraft might provide some relief from the air and ground congestion in the 1970's as these planes operate from very short runway strips. These could be located near city centers or on satellite fields around the major metropolitan areas, and at major air terminals. Recent public opposition to the construction of new airfields near large cities, however, has dampened the enthusiasm for S.T.O.L. aircraft, and may give new impetus to helicopter service using larger helicopters. In 1968 the F.A.A. initiated an experimental S.T.O.L. operation serving the three airports (Washington National, Dulles International, and Friendship International, at Baltimore, Md.) of the Washington (D.C.)-Baltimore metropolitan area.

In addition to the S.T.O.L. experiment in the Washington area, La Guardia Airport in New York City has been equipped with an S.T.O.L. airstrip, separate from the main runways and therefore separable from the main air-traffic patterns, and a major airline was experimenting with an S.T.O.L. operation.

Air Traffic Control. An indispensable element in the operation of a modern major aircraft terminal is the existence of the air-traffic control system. Without the airport control tower and radar approach and departure-control facility, the capacity of the airport to handle traffic would be significantly reduced when the weather is worse than that permitted by the F.A.A. for visual flight operations.

The airport-control towers, integral elements in the entire national and international air-traffic control system, are, nevertheless, the starting and ending point of system control. In the early 1970's some 350 control towers were being operated by the F.A.A. at the busier publicly owned airports. In addition, 10 military-staffed towers were operated at military fields (although some military towers were staffed by F.A.A. controllers), and 15 towers were operated privately. About 30 other terminal radar-control facilities (TRACON), not associated directly with control towers, were operated by the military services.

Control-tower operations are divided into two broad categories: visual (radar-aided) control of traffic in the immediate vicinity of the airport, from the glass-walled tower "cab"; and approach and departure control by radar, within approximately 30 to 40 mi. of the airport. See RADAR.

Both V.F.R. and I.F.R. traffic are controlled at tower-equipped airports by the I.F.R. room, although the F.A.A. had initiated restrictions on V.F.R. flights at some of the busier terminals in 1968, partly to alleviate the congestion.

Controllers guide the traffic from a number of control positions, all of which are rotated regularly, at about 2-hr. intervals, to keep all controllers fully qualified for all positions. Staffing of the towers depends on the volume of traffic served. Most of the towers without radar-control facilities (about 200 in the early 1970's) average 10 controllers. The radar-equipped towers average about 25. In all, about 7000 F.A.A. con-

The modern Charles de Gaulle Airport, 12 mi north of Paris, was opened in 1974 The circular Terminal No 1, with its seven satellite buildings, can handle up to 10,000,000 passengers and 400,000 tons of freight annually.
Aéroport de Paris

trollers were employed in all kinds of towers at any one time during this period.

The equipment used by the controllers, in addition to radar, includes light guns for communicating with aircraft that have no radio equipment, and a complex communications network of radio and telephone equipment. Computer-based automated radar terminal systems were in use at airports in the U.S. in the early 1970's.

Tower service begins when the flier operating under V F.R. first radios in from about 15 to 20 mi. away. If he is flying under I.F.R , and therefore under the control of the F.A A. Air Route Traffic Control Center, the first call is made when the center controller transfers him to the approach controller in the tower.

After the tower controller acknowledges the airplane, he radios certain instructions to the pilot, principally direction and altitude of landing pattern, the active runway (the one to use, based on wind direction), wind direction and velocity, weather data, and altimeter setting. The pilot is then directed to a position in the landing sequence. After landing, he is given taxiing instructions. The tower also assists the pilot in locating and identifying any other airplanes that he has to follow in the landing sequence.

Generally, V.F R towers control air traffic within approximately a 5-mi. radius around the tower and up to any altitude In the case of terminal radar-control towers, the area is an irregular shape of greater diameter The maximum altitude is usually limited to 5000 ft or less

Aids to Navigation. Bad-weather landings are facilitated by the radio-based Instrument Landing Systems (I.L S.), provided by the F A.A. at more than 300 airports in the early 1970's. The ground equipment transmits signals in two planes (vertical and horizontal, defining the landing path and the glideslope) Instruments in the aircraft cockpit indicate to the pilot how close he is to the landing path or the glideslope The I.L.S. is used for the final portion of flight, from the time that terminal radar control has turned him onto the landing path

Bad-weather takeoffs can be accomplished with only the instruments in the aircraft, in addition to the instructions from radar departure controllers.

See also NAVIGATION· *Electronic Navigation.*

L A.B

AIR PUMP. *See* AIR COMPRESSOR.

AIRSHIP, lighter-than-air craft equipped with a bag containing a gas to lift the ship, a means of propulsion, means for adjusting buoyancy, and one or more gondolas for the crew, passengers, and power units. The bag, usually containing helium or hydrogen, is elongated or streamlined to enable easy passage through the air. The means of propulsion usually comprises one or more engines and propellers. A means for releasing the ballast, usually sand or water, is used to increase buoyancy; and a means for releasing gas is used to reduce buoyancy. To steer the airship, the pilot uses one or more vertically hinged rudders, and to control climb or descent employs one or more horizontally hinged elevators. Airships, known also as dirigibles, were developed from the free balloon (q.v.). Three classes of airships are recognized: the nonrigid, commonly called blimp, in which the form of the bag is maintained by pressure of the gas; the semirigid airship, in which, to maintain the form, gas pressure acts in conjunction with a longitudinal keel; and the rigid airship, in which the form is determined by a rigid structure. Technically all three classes may be called dirigible balloons, the word dirigible being derived from the Latin *dirigere,* meaning "to direct, to steer".

The first successful airship was that of the French engineer and inventor Henri Giffard (1825–1882), who in 1852 constructed a cigar-shaped, nonrigid gas bag 143 ft. long, driven by a screw propeller rotated by a 3 h.p. steam engine. He flew over Paris at a speed of about 6 m.p.h. Giffard's airship could be steered only in calm or nearly calm weather. The first airship to demonstrate its ability to return to its starting place in a light wind was the *La France,* developed in 1884 by the French inventors Charles Renard (1847–1905) and Arthur Krebs (1847–1935). It was driven by an electrically rotated propeller. The Brazilian aeronaut Alberto Santos-Dumont (q.v.) developed a series of fourteen airships in France. In his No. 6, in 1901, he circled the Eiffel Tower in the air.

The American Thomas S. Baldwin (1854–1923) built a dirigible flown by Roy Knabenshue (1877–1960) in 1904. Walter Wellman (1858–1934) failed in an effort to cross the Atlantic Ocean in an airship in 1910. Although many successful flights were made before 1910, the best engine available for use in the early airship was too heavy in proportion to its power.

Count Ferdinand von Zeppelin (q.v.), the German inventor, completed his first airship in 1900; this ship had a rigid frame and served as the prototype of many subsequent models. The first Zeppelin consisted of a row of 17 gas cells, individually covered in rubberized cloth and the whole confined in a cylindrical framework covered with smooth-surfaced cotton cloth. It was about 420 ft. long and 38 ft. in diameter; the hydrogen-gas capacity totaled 399,000 cu. ft. The ship was steered by forward and aft rudders, and was driven by two 15 h.p. Daimler benzine engines, each rotating two propellers. Passengers, crew, and engine were carried in two aluminum gondolas suspended forward and aft. At its first trial, on July 2, 1900, the airship carried five persons; it attained an altitude of 1300 ft., and flew a distance of 3.75 mi. in 17 minutes.

The first commercial means of regular passenger air travel was supplied by the zeppelin airships *Deutschland* in 1910 and *Sachsen* in 1913. At the beginning of World War I, 10 zeppelins were in service in Germany, and others were being built for the military services. By 1918 the total number of zeppelins constructed was 67, of which 16 survived the war. Those not cap-

The nonrigid dirigible, or blimp, was formerly used for military scouting and reconnaissance work by France, Germany, Great Britain, and the United States. It is today, however, employed almost exclusively for aerial photography of sports events and for advertising, display, and publicity purposes. UPI tured were surrendered to the Allies by the terms of the Treaty of Versailles (q v.) in 1919 At the outbreak of the war, France had a fleet of semirigid airships, developed by officers of the French army The experience of the war, however, in disclosing the vulnerability of airships to airplane attack, caused the abandonment of the dirigible for offensive military purposes Nonrigid airships continued to be used for aerial observation, coastal patrol, convoying, and locating enemy submarines and mines, because of their advantages over the airplane in being able to hover over a given location and to remain in the air for a longer period *See also* WORLD WAR I *Aircraft Operations (1914–18)*

Toward the end of World War I, the British began intensive development of rigid airships, stimulated by the prospect that noninflammable helium (q v.) gas would soon be available in quantity sufficient to inflate large ships. The *R34,* with a length of 643 ft and a gas capacity of 1,980,000 cu ft , was commissioned in 1919 It made the first transatlantic flight of an airship, flying by way of Newfoundland from East Fortune, Scotland, to Mineola, N Y., and returning to Pulham, England The total flying time for the round trip was 183 hr and 15 min., and the aggregate mileage about 7000 In 1921 the *R38,* some 25 percent larger than the *R34,* was completed, both ships were wrecked that same year

The U S. government purchased in 1921 a large semirigid airship named the *Roma* It had a length of 410 ft. and a gas capacity of 1,200,000 cu ft , and was powered by six 12-cylinder 400 h p. motors. The ship was lost in 1922 and in 1923 the U.S. Navy commissioned the *Shenandoah,* originally known as the *ZR1,* the first Zeppelin type airship to be of entirely American construction, and the first of the type to be filled with helium gas. It had a length of 677 ft and a gas capacity of 2,115,000 cu ft. In the two years following, it made several extended and successful flights, but in September, 1925, it was completely wrecked in a wind storm, with the loss of fourteen crew members. The twenty-nine survivors undoubtedly owed their lives to the use of nonexplosive helium for inflation. In 1924 the U.S. Navy received delivery of the *ZR3,* later christened the *Los Angeles,* made by the Zeppelin works in Germany as a partial payment of war reparations. This airship was 650 ft long and had a gas capacity of 2,475,000 cu.ft. The control gondola also carried accommodations for thirty passengers, with sleeping facilities similar to those of a Pullman car The *Los Angeles* made about 250 flights, including trips to Puerto Rico and Panama, and several trips across the continent It was decommissioned in 1932

In 1926 the Italian airship *Norge,* a semirigid craft of about 650,000 cu ft capacity, flew from Spitsbergen, Norway, over the North Pole to Teller, Alaska, where the ship was dismantled Another polar flight was attempted two years later in a similar ship, the *Italia,* but, after passing over the Pole, it was wrecked on the return flight, with the loss of eight lives, *see* ARCTIC *Exploration*

The German Zeppelin plant in 1928 produced the *Graf Zeppelin* which had a length of 772 ft and a gas capacity of 3,710,000 cu ft It flew a total of more than 1,000,000 mi in nine years of service, crossing the Atlantic Ocean to North or South America 139 times, and making a complete trip around the world with stops only at Tokyo, Japan, Los Angeles, Calif , and Lakehurst, N J

About the same time, the British resumed construction of rigid airships, launching the *R100* and the *R101* in 1929 With lengths of 707 ft and 724 ft respectively, these dirigibles had a gas capacity of 5,000,000 cu ft each The *R101* was powered by five 650 h p diesel engines, and had dining, sleeping, and recreational accommodations for 100 persons built into the hull. In October, 1930, on a flight to India, it crashed during a violent rain storm into a hill near Beauvais, France, and was completely destroyed by fire, 46 of the passengers and crew lost their lives The *R100,* which in the preceding August had made a round trip to Montréal, Canada, was scrapped after the destruction of the *R101,* and the British government abandoned construction of dirigibles

Meanwhile, in 1928, the U.S. Navy purchased two dirigibles, each with a length of 785 ft , a gas capacity of 6,500,000 cu ft. of helium, and eight 560 h.p. engines. A novel feature of the design was provision for a hangar compartment in the ship capable of accommodating five scout airplanes, which could be released or taken aboard in flight. The first of these airships, the *Akron,* was completed in 1931, and was wrecked in a storm off the New Jersey coast in 1933. The second ship, the *Macon,* was completed in 1933, and wrecked in 1935 Since the *Macon,* the U S. has built no rigid airships

The last and largest of the notable dirigible airships was the German-built *Hindenburg.* It had a length of 804 ft., and a gas capacity of 6,710,000 cu ft. After making ten transatlantic crossings in regular commercial service in 1936, it was destroyed by fire in 1937 when it was landing at Lakehurst on its first trip of the sea-

The German airship Hindenburg *crashes in flames at Lakehurst, N.J., on May 6, 1937.* Associated Press

son. Thirty-six of its ninety-two passengers and crew were killed.

Since the destruction of the *Hindenburg*, airship activity has been confined to the nonrigid type of crafts. In 1938 all military blimps in the U.S. were placed under Navy jurisdiction, with the Naval Air Station at Lakehurst as center of operations. During World War II, blimps were employed for patrol, scouting, convoy, and antisubmarine work. In addition to military craft, a private commercial firm in the U.S. has developed several small nonrigid airships, that are used chiefly in carrying large display signs for advertising purposes and for carrying television crews and equipment for taking aerial views of sports events and other notable occasions.

After World War II the U.S. Navy continued to develop the airship for such purposes as antisubmarine warfare, intermediate search missions, and early warning missions. The largest of Navy airships, the *ZPG-2* type, was 324 ft. long and had a capacity of 875,000 cu.ft. of helium. An airship of this type stayed aloft without refueling for more than 200 hr. The U.S. Navy discontinued the use of airships in 1962. L.A.B.

AIRSICKNESS. *See* AVIATION MEDICINE: *Altitude Sickness;* MOTION SICKNESS.

AIR TRANSPORT, carrying of passengers, freight, or mail by aircraft. From the beginning of aviation in 1903 until the end of World War I in 1918 little practical application was made of the airplane as a vehicle of public transportation. The wartime use of military aircraft was responsible for the development of airline services in Europe and the United States almost immediately after the end of hostilities. Denmark, a neutral country during the war, was the first to begin transport operations. By the end of 1919 many European capitals were connected by scheduled airline flights. Between 1920 and 1940 the French, Dutch, and British organized trunk routes to their African and Far Eastern colonial possessions, and Germany introduced air transportation to South America.

In the U.S., the Post Office Department (*see* POSTAL SERVICE, UNITED STATES) established the U.S. Air Mail Service in 1918 and began transporting mail by air transcontinentally. Nine years later the Post Office Department withdrew from direct operation of the airmail service (see AIRMAIL) and contracted for the transportation of mail with private airline companies, which took over the operation of the original mail routes, opened additional routes, and inaugurated service for passengers and freight. During the 1920's, these developments proceeded more slowly in the U.S. than in Europe. European aircraft and terminal accommodations were also of better quality than were those in America during the first postwar decade.

Nevertheless, by 1928 a number of domestic air services were established in the U.S. Services then available included a transcontinental route and local routes on the eastern and western coasts. Scheduled night flying, the beginning of bad-weather instrument flying, and the advent of the DC-3 twin-engine transport airplane all contributed to the expansion of airline services in the early 1930's.

During this expansion, the economic and technical development of the new airline industry was almost entirely unregulated, and in some cases safety provisions were inadequate. Consequently, Congress, working closely with aviation leaders, adopted in 1938 the Civil Aeronautics Act. The federal agencies established to carry out the mandates of the act were the independent Civil Aeronautics Board (q.v.) and the Civil Aeronautics Administration of the Department of Commerce.

Immediately after the Japanese attack on Pearl Harbor (q.v.) during World War II, approximately half the fleet of 360 transport aircraft operated by the airlines was turned over to the Federal government. Those aircraft formed the nucleus of the Air Transport Command of the U.S. Army Air Forces. Of necessity, the operations of U.S. commercial airlines were sharply curtailed, and a passenger-priorities system was instituted for the duration of the war.

In the decade following World War II, airline operations were resumed by most European nations and rapidly developed by a number of near Eastern and Asian countries Cooperative agreements among air-transport companies of different nations were concluded, and the International Civil Aviation Organization (q v) was formed in 1947 to establish international standards and regulations

Air-carrier operations in the U S were modernized during the first postwar decade The change in equipment began in 1946, when surplus military four-engine aircraft became available for airline use Subsequently, new multiengine designs, featuring pressurized cabins and improved instrumentation, were introduced The total number of air transports in 1946 was approximately 675, mostly two-engine, piston-driven types These were supplanted first by four-engine piston-driven planes and later by jet-propelled planes In the mid-1970's about 2360 transport airplanes were in service, of which about 2070 were jet-propelled craft In addition to use on long-distance, nonstop flights, jet-propelled airliners had come into extensive use for shorter hauls.

The number of domestic passengers carried by U S. airlines increased from about 12,000,000 in 1946 to about 178,000,000 in the middle of the 1970's.

No phase of airline operation is more important than safety. After 1953 the U.S. air-carrier industry maintained a world record of less than 1 fatality per 100,000,000 passenger-miles flown, which compares favorably with the best safety records of omnibus lines and railroads and is considerably better than that for private automobiles. Some twenty years later, the rate had further declined to a third of that in 1953. In 1959 the Civil Aeronautics Administration was absorbed by the newly formed Federal Aviation Agency, which assumed responsibility for regulation of civil aviation in the U.S. The National Transportation Safety Board has responsibility for investigating aircraft accidents *See* FEDERAL AVIATION ADMINISTRATION

The scheduled airlines in the early 1970's had an investment of about $12,000,000,000 and employed approximately 300,000 persons. With the introduction of jet propulsion, the airlines of the world entered a period of overcapacity, a term embracing all the industry's major ills· excessive competition, rising seat-mile costs, and decreasing aircraft-utilization rates To remedy this situation, a number of airline mergers were carried out in the early 1970's, together with a cutback in operations over existing airline routes.

The U.S. far exceeds other countries in the number of passenger-miles regularly flown, with about 115,350,000,000 domestic passenger-miles flown annually in the early 1970's The world is also covered with an intricate network of routes by such airline services as British Airways, of Great Britain; Air France, of France, Sabena, of Belgium, Scandinavian Airlines System (SAS), of Denmark, Norway, and Sweden, Lufthansa-German Airlines, of West Germany, Japan Air Lines (JAL), of Japan, KLM Royal Dutch Airlines, of the Netherlands, and Aeroflot, of the Soviet Union In the early 1970's about 4,393,000,000 miles were flown annually by members of the International Civil Aviation Organization, including the U S

Passenger and Crew Safety Measures. As commercial airlines fly faster and higher, measures to improve passenger and crew safety are constantly being studied and implemented Unlike military aircraft, commercial airliners are not equipped with parachutes and ejection seats Most jet airliners cruise at altitudes of about 30,000 ft , and safe bailout at such an altitude without pressure suit and oxygen mask would be very unlikely

Because of the high cruising altitudes, considerable attention is paid to maintaining safe and comfortable cabin pressure Oxygen-pumping equipment is regularly checked Recent F A A regulations for new jet airliner designs require reduced window area The objective is to limit cabin decompression to a tolerable level in the event of a window failure Various means of minimizing injuries during emergency landings are being studied and tested Seating passengers facing rearward was considered, but the practical values of this seating are questionable, and it is considered psychologically undesirable. Another alternative is to secure the passengers very firmly by some means during an emergency landing. In one procedure, passengers are instructed to place pillows and rolled blankets between them and the seats in front of them The success of this procedure has also prompted studies of various inflatable cushioning devices, which could normally be stored inconspicuously in the backs of seats and inflated automatically if needed Inflatable slide chutes have also been successfully used in emergencies to help passengers leave aircraft rapidly

See also AIRPORT; AVIATION MEDICINE. L A B

AIR WARFARE, military operations above the surface of the earth Tactically, these operations include support of land and sea forces by aerial observation of the enemy, directing the fire of ground and naval weapons, transporting troops, equipment, and supplies; and strafing and bombing. Strategically, air warfare includes the bombardment of the enemy's factories, communications systems, and population centers, and securing and maintaining command of the air.

18th and 19th Centuries. Lighter-than-air balloons were the first vehicles of air warfare. In 1794, eleven years after the first balloon ascension at Versailles, France, French army observers at Fleurus during the wars of the French Revolution helped direct artillery fire against the Austrians while floating above the battlefield in tethered balloons.

The United States first used military balloons in 1862–63 during the Civil War when the Army of the Potomac was able to observe Confederate movements. When Paris was under siege during the Franco-German War (q.v.), sixty-four balloons crossed over the German lines, carrying about 4,000,000 letters, eighty-eight passengers (including Léon Gambetta (q.v.) minister of the French Republic), and a great many homing pigeons which returned to the city with messages. A balloon sent to Cuba during the Spanish-American War (q.v.) was used to direct American artillery fire at the battle of San Juan.

Early 20th Century. By the beginning of the 20th century, the aeronauts Count Ferdinand von Zeppelin and Alberto Santos-Dumont (qq.v.) had developed cylindrical-shaped, internally reinforced balloons with attached, engine-driven propellers that were capable of directed flight (*see* AIRSHIP). The Germans had two Zeppelins when World War I started, but hurriedly constructed sixty-seven more, and bombed London and Paris early in the war. Because the airships proved extremely vulnerable to attack by enemy aircraft the bombings were abandoned. *See* WORLD WAR I: *Aircraft Operations (1914–18).*

A German Zeppelin spotlights the seaside town of Yarmouth, England, during World War I (1915), in a composite photograph.

UPI

The future of air warfare lay with propeller-driven aircraft. They were first used by the Italian army during the Italo-Turkish War of 1911 in Libya to observe movements of the Turkish forces. By the Balkan War of 1912–13 (see BALKAN WARS), the usefulness of aircraft had become obvious, and all the major powers had added air forces to their armies. In the U.S. Army, airplanes were assigned to the Signal Corps.

Airplanes were used primarily for observation at the beginning of World War I. Occasionally, bombs were dropped by hand over the side of the cockpit. In an air encounter, pilots might exchange shots with pistols. As the war progressed, bombsights and standardized bomb fittings increased bombing effectiveness. A Dutch aircraft designer, Anthony Fokker (q.v.), invented a synchronizing mechanism that enabled machine guns permanently mounted on an aircraft to fire forward through the propeller without striking the blades. Specialized types of aircraft were developed, fighters such as the French Nieuport and SPAD, the latter taking its name from two French aviation Societies, the British Sopwith Camel, and the German Fokker, as well as bombers such as the British De Haviland, Handley Page, and the Italian Caproni. Combat tactics gradually evolved to obtain control of the air over the battlefield as an effective support for ground combat. The most far-reaching concept to emerge from World War I was strategic bombing. The purpose was to destroy the enemy's capacity to produce and his will to fight by striking directly at his industrial resources and cities with overwhelming power. Giulio Douhet (1869–1930), an army officer who commanded Italy's first aviation unit from 1912 to 1915, was the first to envision air power as the dominant force in warfare. He argued for an independent air force assigned the mission of gaining mastery of the air. The frankness and vehemence of his views resulted in his being court-martialed, sentenced to prison, and dismissed from the service. The Italian defeat at Caporetto (see CAPORETTO, BATTLE OF) in 1917 vindicated his views, and he was recalled to duty the following year.

Hugh Montague Trenchard (1873–1956), commander of the British Royal Flying Corps, and William (Billy) Mitchell (q.v.) commander of the air units assigned to the American Expeditionary

Force in France, had similar views When the Royal Air Force was created in April, 1918, as a separate and coequal military service, Trenchard became its first commander Both he and Mitchell were planning extensive attacks against German war production when the war ended In addition, Mitchell was planning to drop paratroopers behind the German lines

Certain that the bomber marked the end of seapower, Mitchell agitated for an independent air force to defend the American coastline In July, 1921, he organized demonstrations in which bombers sank three former German vessels, including a battleship, at the mouth of Chesapeake Bay, and in January, 1923, destroyed two obsolete American battleships, the *Virginia* and the *New Jersey*, off Cape Hatteras. These experiments convinced the U S Navy of the need for aircraft carriers to defend battleships against air attacks A highly vocal and persistent crusader for air power, Mitchell was court-martialed late in 1925 for insubordination and suspended from active duty. He resigned from the army early in 1926 The B 17 Flying Fortress, B-24 Liberator, and B 29 Superfortress of World War II were largely due to the influence of his doctrines.

World War II. World War II showed clearly the advances the Germans had made in tactical air warfare since 1918. Blitzkrieg operations, in which armored columns were closely supported by fighters and Stuka dive-bombers, quickly overran Poland, Denmark, Norway, the Low Countries, and France Attempts, however, to use air power strategically failed. In the Battle of Britain, when German bombers attacked Britain after the defeat of France in 1940, they destroyed neither the British capacity to produce nor the will to fight. With the help of the newly developed radar (q.v.), British fighters compelled the Germans to abandon day attacks and resort to less effective night bombings.

In 1942, bombers of the Royal Air Force, Stirlings, Halifaxes, and Lancasters, together with American B 17's and B 24's based in England, launched a Combined Bomber Offensive against Germany and German held targets in Europe. British night bombers made saturation attacks against German cities and large industrial complexes. American bombers carried out daylight attacks of precision bombing against specific industrial and military targets. The American planes suffered heavy losses until late 1943, when long-range fighter escorts–P-51 Mustangs and P-47 Thunderbirds–became available. Bombers could then fly deep into Germany with relative impunity.

In World War I, American air units in France had carried out 150 separate bombing attacks and dropped 138 tons of bombs In World War II, the Combined Bomber Offensive dropped about 2,700,000 tons of bombs on enemy targets Strategic bombers occasionally gave close tactical support to ground troops, notably at Monte Cassino, Italy, and Caen and Saint-Lô, France

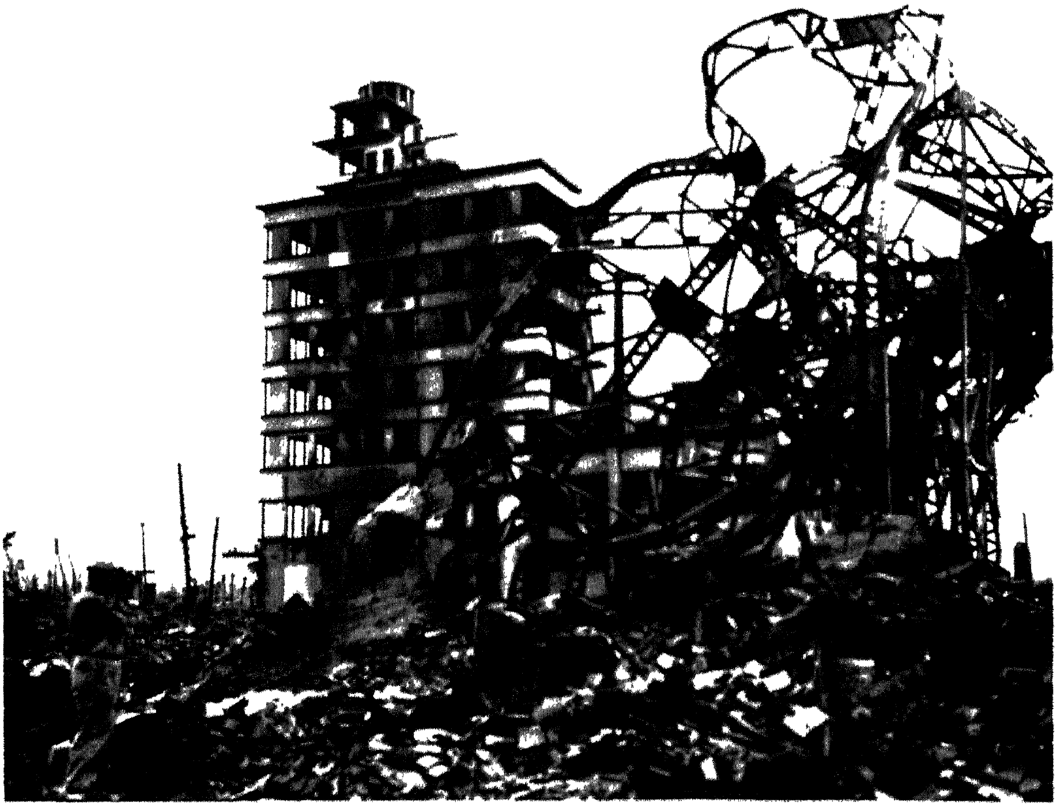
German developments indicated the future of air warfare, when the V-1, a pilotless plane propelled by a pulse-jet engine and carrying 2000 lb of explosives was launched against English targets in June, 1944 (*see* GUIDED MISSILES) The V-2, a true guided missile about 47 ft long, 5 5 ft. in diameter, and weighing 27,000 lb , was first used in September, 1944 It developed 55,000 lb of thrust and carried about 1650 lb of explosives a maximum distance of 200 mi The first jet aircraft, the German Messerschmitt 262, flew in combat in 1945, but in insufficient numbers to have any appreciable effect. *See also* JET PROPULSION, ROCKET

The war in the Pacific similarly showed the importance of air power, from the Japanese attack on Pearl Harbor, through the naval battles of the Coral Sea (q v), Midway (*see* MIDWAY ISLANDS), the Solomon Islands, and Bismarck Sea, to the decisive Battle of Leyte Gulf

The major purpose of capturing the Marianna Islands (q.v.) was to obtain a base from which B-29 bombers could attack Japan The Battle of Iwo Jima too, was fought to secure a landing field for damaged bombers returning from raids and for escort fighters The B-29 bombers began bombing Japan systematically in 1944, and by 1945 a series of large-scale incendiary attacks had destroyed Japan's major cities The first atomic bomb was dropped on Hiroshima by a B-29 on Aug 6, 1945, and the second was dropped on Nagasaki three days later

Postwar Era. After the war, the German scientists who had developed the V-1 and V-2 guided missiles emigrated to the U S and the Soviet Union in large numbers. By the 1950's, families of surface-to-air, surface-to-surface, air-to-air, air-to-surface missiles, and missiles fired from underwater were adopted by the armed forces of major nations. *See* GUIDED MISSILES

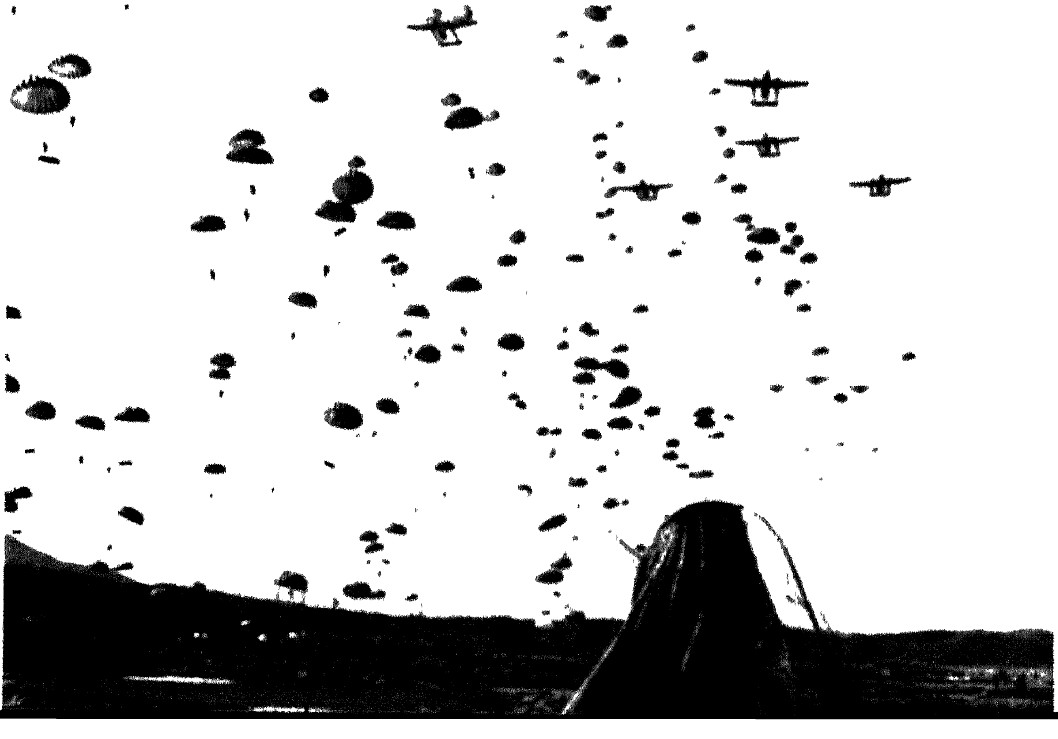
Since the early 1950's, air power has been considered the decisive form of power, first because manned bombers could carry atomic weapons, and later because rockets and guided missiles could strike targets anywhere with great accuracy and overwhelming force. By the 1960's, the manned bomber had become obsolete as a strategic weapon.

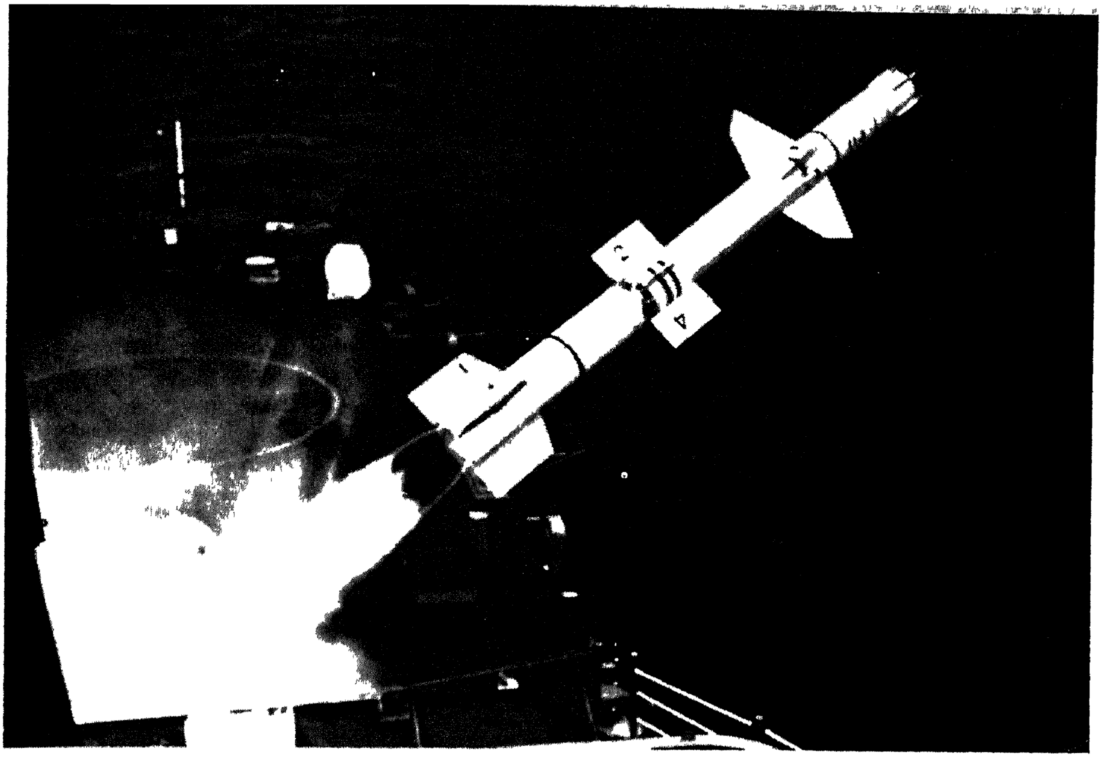


UPI

Air Warfare in World War II and Korea. The gutted [illegible] of the Chugoku [illegible] building [illegible] stands alone on the main street of Hiroshima, Japan, on Aug. 6, 1945, in the devastation [illegible] atomic bomb used in warfare. Paratroopers (below) float earthward from C-119 planes [illegible] retreating Communist units south of Munsan, Korea.

U S Army





Among missiles in the arsenal of the U S Navy is the TALOS, a long-range, surface-to-air missile U S Army

The limited wars fought since World War II show a continuing use for tactical manned aircraft. The Korean War marked the transition from propeller driven to jet aircraft It also marked the first large scale use of helicopters to perform the functions of liaison, observation, fire control, transportation of troops and weapons, and medical evacuation; these functions had previously been carried out by winged aircraft Helicopters were used even more intensively in the Vietnam conflict, becoming the primary air weapon for the close support of ground troops.

The winged fighter bombers such as the U.S. Navy A-7's and the U.S. Air Force F-4 Phantoms and F-105's were used in Vietnam primarily to soften enemy concentrations with tactical strikes or for precision bombing of urban targets. The high-altitude B-52 strategic bombers were used for the so-called carpet-bombing missions.

See also AIRCRAFT CARRIER; AIRPLANE. M.B.

AIRWAY, originally defined as a straight line connecting navigational-radio transmitting sites, or the intersection of straight lines connecting two sites; by the beginning of the 1970's, the term "airway" had become obsolete. *See* RADIO AIDS TO NAVIGATION Although the Federal Aviation Administration (q.v.), or F.A.A., still defined and maintained over 200,000 mi. of airways in the airspace over the continental United States, a new area-control concept had been introduced in 1960. By 1970 virtually all the airspace over the continental U S above 24,000-ft altitude was defined as A P C. (Area of Positive Control) airspace In the heavily traveled central-northeastern portion, the A P C altitude is above 18,000 ft. All flight in this airspace, whether on established airways or not, is under ground control of the F.A A Air Route Traffic Control Centers, and pilots must fly by Instrument Flight Rules (I F.R.) and have relatively advanced electronics communication and identification equipment (radar transponder)

Governmental agencies such as the Civil Aeronautics Administration (q v), now the F A.A , were established for the regulation of civil routes and air-traffic control Commercial aircraft are required to follow approved flight plans specifying routes, speeds, altitudes, and reporting points along the route

Once the aircraft has left the vicinity of the airport, and is making its transition to the en route portion of flight, control of its route passes to the nearest Air Route Traffic Control Center if it is flying under an I F R. flight plan The Air Route Traffic Control Centers are responsible for providing the distance between I F R aircraft flying in the controlled airspace

The plane remains the responsibility of an individual center until it leaves the jurisdiction (about 300 to 500 mi.) of that center, then the plane is turned over to the next center, and so on. At designated points along his route, the pilot radios his position to the controller, who enters this information on the flight progress strip that represents that particular flight. These progress strips are then placed on a sloping board in front of the controller. In those areas having radar coverage, the controller sees the airplane he controls on a radar screen with a range of approximately 200 mi. Pilot and controller communicate by voice on radio. When the airplane is approximately 20 mi. from its destination, the center controller turns his responsibility for the airplane over to the approach controller in the airport tower. In one year in the late 1960's the F.A.A. logged over 100,000,000 I.F.R. movements.

A few of the early low-to-medium frequency "beam" radio ranges existed at the end of the 1960's, but they had largely been replaced by the more accurate, stable and interference-free V.H.F. (Very High Frequency) system. The V.H.F. system is divided into two route levels: low, extending from 700 ft. above the surface, generally up to 18,000 ft.; and high, extending from 18,000 ft. to 45,000 ft. No designated routes existed above this altitude range at the end of the 1960's.

The backbone of the V.H.F. radio navigation system is a network of V.H.F. Omnirange (V.O.R.) stations across the U.S. The V.O.R. system was adopted as the international standard to replace the beam system.

The new V.H.F. omnirange radio transmitters (V.O.R.'s) broadcast what is, for practical flying purposes, 360 distinct and selectable courses to and from a given transmitter site. The designated courses coincide with magnetic headings for the area in which the facility is located. Although range of the V.O.R. stations is limited to about 50 mi. at low altitudes, and about 100 mi. at high altitudes, the F.A.A. had installed almost 900 V.O.R.'s by the end of the 1960's, giving full coverage in heavily traveled areas. The military services had about 40 more in operation and more than 20 V.O.R.'s were privately owned at that time.

The addition of Distance-Measuring Equipment (D.M.E.) to the basic V.O.R. system in the late 1950's and 1960's greatly increased the flexibility of the air-navigation system. The D.M.E. system gives the pilot a direct reading of his distance away from, or to, the selected V.O.R. station. Holding patterns, reporting points, and navigational fixes can be designated using a single V.O.R. and a distance. Other fixes and reporting points may be designated by the intersection of specified courses from two V.O.R.'s.

In the early part of the 1970's an additional navigational system was being incorporated into the existing V.O.R. network. Area-navigation equipment, which freed the aircraft from the in-trail limitations of a single radio course, had been found useful for military purposes and for low-altitude helicopter operations for which standard V.O.R. signals were not at a peak reliability and efficiency. With the air traffic congestion problems in the late 1960's and early 1970's, area navigation equipment became more attractive and experiments with its use were well under way.

The equipment had been available for a number of years, but operational procedures had to be tested. One of the fundamental advantages of area navigation was that it returned a greater measure of autonomy to the cockpit, thereby reducing the air traffic controller's work load.

Area navigation equipment uses simple airborne computers that receive the signals from two or more ground transmitters to create a "phantom" station location which can be placed anywhere the pilot wishes within the range of the actual stations. Many of the area-navigation systems also provide a moving-map cockpit display, with an inking pen or other device to trace the track of aircraft accurately across the ground. The pilot therefore has a precise map picture of his location, direction, and speed at all times. L.A.B.

AISHA or **AYESHAH** (611?-78), favorite wife of the Prophet Muhammad (q.v.), founder of Islam (q.v.), after the death of his first wife Khadija (555?-619?). Because of her devotion to Muhammad's teachings, Aisha is known among Muslims as Mother of the Believers. After the death of Muhammad in 632 she helped her father, Abu Bakr (q.v.), become first caliph, or ruler, of the Muslims.

AISNE (anc. *Axona*), river in N. France, a tributary of the Oise R. It rises in the Forest of Argonne, flows N.W. for the first two fifths of its course, and then flows W. to the Oise, which it joins above Compiègne. The Aisne is about 175 mi. long; more than 100 mi. are navigable, and canals connect it with the Meuse and Marne rivers.

AISNE, BATTLES OF. See WORLD WAR I: *The Campaigns and Other Events of 1918*.

AIX or **AIX-EN-PROVENCE,** city of France, in Bouches-du-Rhône Department, about 20 miles N. of Marseille. Aix trades in oil, wine, and almonds. The chief industries are cotton spinning, leather dressing, and the manufacture of olive oil, flour, candy, and hats. Faculties of law and economic sciences, letters and humane sciences, and various institutes are located in the

Aix division of the University of Aix-Marseille. Aix was founded about 123 B.C. by the Romans, who named its thermal springs Aquae Sextiae. During the Middle Ages the city was long the literary capital of southern Europe. Pop. (1968 est.) 67,943.

AIX-LA-CHAPELLE. *See* Aachen

AIX-LA-CHAPELLE, CONGRESS OF, first of several meetings (1818) of Austria, Great Britain, Prussia, and Russia, the powers victorious over France in the Napoleonic Wars (q.v.). At Aix-la-Chapelle the four powers agreed to withdraw their occupation troops from France and to invite France to join them in an alliance to preserve order and combat revolutions in Europe. The most important result of the congress was the reconfirmation of the Holy Alliance (q.v.).

AIX-LA-CHAPELLE, TREATIES OF, two pacts signed in the city of Aix-la-Chapelle (now Aachen, West Germany).

The Treaty of Aix-la-Chapelle (signed May 2, 1668) terminated the War of the Devolution (1667–68), the first war between France and Spain for the possession of the Spanish Netherlands. The treaty returned the district of Franche-Comté to Spain and gave to France twelve towns on the border of the Netherlands. *See* Devolution, War of the.

The Treaty of Aix-la-Chapelle (signed Oct. 18, 1748) ended the War of the Austrian Succession (1740–48), including the American campaigns of that war, known as King George's War (q.v.). The principal provisions of the treaty restored all conquered territory (including the British conquest of Louisburg in Canada to prewar status, ceded Silesia to Prussia, and confirmed the succession of Maria Theresa (q.v.) to the Austrian throne. *See* Succession Wars: *War of the Austrian Succession;* Pragmatic Sanction.

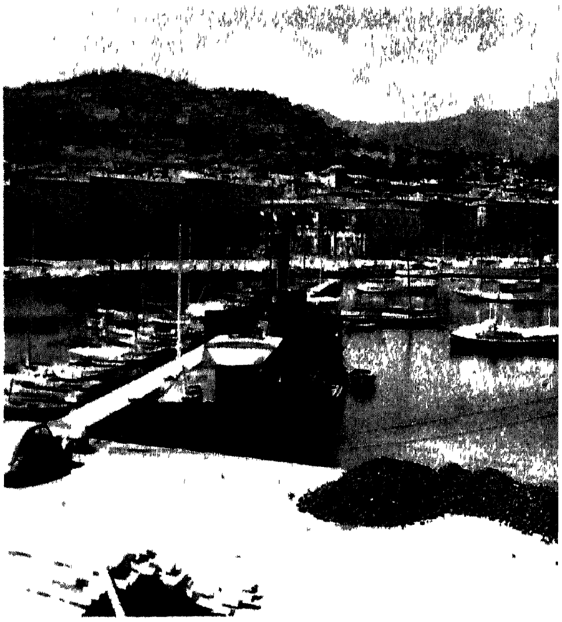
AIX-LES-BAINS (anc. *Aquae Gratianae*), town of France, in Savoie Department on Lake Bourget, about 8 miles N. of Chambéry. Each year thousands of tourists visit the two hot springs (about 109° and 113° F.) of Aix-les-Bains, famous since ancient times. The springs are used for both drinking and bathing. Pop. (1968 est.) 18,270.

AÍYINA *or* **AEGINA,** island of Greece, in the province of Atikki, in the Saronic Gulf, an arm of the Aegean Sea, about 17 miles S.W. of Athens. The island is mountainous, triangular in shape, about 7 mi. long and about 8 mi. wide. The principal city, Aíyina, is on the N.W. part of the island in a fertile plain in which grains, grapes, olives, figs, almonds, and peanuts are grown. Tourism and sponge fishing are the other major industries of the island. About 5 miles E. of the city are the ruins of an ancient temple of Apollo in which several marble statues dating from the 5th century B.C. were discovered in 1811. The island, named for the mythological nymph Aegina whose son Aeacus (q.v.) was king of the island, was conquered by the Dorians (q.v.) about 1200 B.C. It became a flourishing port, trading in corn, oil, wine, and slaves, but it declined in importance after being conquered by Athens in 459 B.C. It was later conquered by the Romans, and then by the Venetians. It remained in Turkish hands from the 16th to the 19th century. Aíyina served as the temporary capital of Greece during the Greek War of Independence in the late 1820's (*see* Greece: *History*). Area, 52.7 sq mi.; pop. about 9500.

AJACCIO, city and seaport of France, capital of Corse-du-Sud Department, on the W. coast of the island of Corsica, at the head of the Gulf of Ajaccio. The chief industries are anchovy fishing, diving for coral, shipbuilding, and the manufacture of macaroni and cigars. Considerable trade is carried on in wine, olive oil, hides, oranges, and timber. Napoleon I (q.v.), Emperor of France, was born in Ajaccio in 1769, and the house in which he lived is now a national landmark. Pop. (1968 est.) 42,282.

A view of the harbor of Ajaccio

French Embassy Press & Information Div



AJANTA CAVES, group of about thirty caves, near the village of Ajanta, Maharashtra State, India. The caves were discovered in 1817 and are famous for their wall paintings, which are works of the Buddhist painter-priests during the period from about 200 B.C. to 200 A.D. Most of the wall paintings represent themes of the Hindu fables known as the Jatakas. The feeling of the kinship of all living things, which plays so large a part in Buddhism (q.v.), is apparent in all the paintings. The composition is simple and informal; although essentially flat, the figures are well developed. *See* INDIAN ART AND ARCHITECTURE. *Painting*.

AJAX, in Greek mythology, mighty warrior who fought in the Trojan War (q.v.). He was the son of Telamon (q.v.), King of Salamis, and led the Salaminian forces to Troy (q.v.). A gigantic man, slow in speech but quick in battle, Ajax was called "bulwark of the Achaeans" by the poet Homer (q.v.). Angered because he was not awarded the armor of the dead Achilles (q.v.), Ajax determined to kill the Greek leaders Agamemnon and Menelaus (qq.v.). The goddess Athena (q.v.), to protect the two, struck him with madness. Ajax committed suicide by falling on his sword.

AJAX, known as the LESSER AJAX, in Greek mythology, chieftain from Locris in central Greece. He fought in the Trojan War (q.v.). After the fall of Troy (q.v.), he violated the temple of Athena (q.v.) by dragging the prophetess Cassandra (q.v.) from the altar of the goddess. Athena appealed to the sea god Poseidon (q.v.) to avenge the sacrilege. When the Greeks sailed for home, Poseidon sent a great tempest that scattered the Greek ships. Ajax was shipwrecked but managed to swim to shore. Clinging to a jagged rock, Ajax boasted that he was a man whom the sea could not drown. Angered by his words, Poseidon split the rock with his trident and Ajax was swept away by the waves.

AJMER, city of the Republic of India, in Rajasthan State, about 85 miles S.W. of Jaipur. The city has many industrial and commercial establishments. Salt, textiles, and agricultural products are the principal articles of trade, and the chief industries include hand weaving, dyeing, cotton ginning, printing, oilseed processing, and the manufacture of leather products and soap. Among noteworthy landmarks in Ajmer are the ruins of an elaborately ornamented Jain temple, built in the 12th century and later converted into a mosque; the tomb of the Muslim religious leader saint Muin-ud-din Chishti (1142–1236); and Mayo Rajkumar College, opened in 1875. According to legend, Ajmer was founded in 145 A.D. Pop. (1971) 262,851.

AKBAR, original name JALAL-UD-DIN MUHAMMAD (1542–1605), Emperor of Hindustan (1556–1605), son of the Mogul emperor Humayun (1508–56), born in Umarkot (now a part of Sind Province in Pakistan). He succeeded to the Hindustani throne in 1556, at the age of fourteen. From 1556 until 1560 the government was administered by a regent, Bairam Khan, who was efficient, but despotic and cruel. In 1560, when Akbar was eighteen years old, he took the government into his own hands. At that time only a small portion of the former Mogul empire was subject to the throne at Delhi. By continuously warring against the northern provinces of India, Akbar succeeded in extending his empire by conquest until finally it embraced the whole of Hindustan north of the Deccan plateau. Akbar administered this vast realm with wisdom, encouraged literature, and fostered education. See INDIA: *History*.

This portrait of Akbar [illegible] of Hindustan by an unknown artist is a Western conception of the Mogul emperor's wealth, typified by his jewel-encrusted throne and peacock-feather fans. Culver Pictures

AKELEY, Carl Ethan (1864–1926), American explorer, naturalist, sculptor, taxidermist, and inventor, born in Clarendon, N.Y., and educated at State Normal School, Brockport, N.Y. He joined the staff of the Field Museum in Chicago in 1895, and that of the American Museum of Natural History in New York City in 1909. He made five trips to Africa, exploring and collecting specimens for the museums. Among his inventions are a cement gun (a device for applying mortar by pneumatic power) and a motion-picture camera for naturalists His mounted animal groups include elephants and gorillas in the American Museum of Natural History He also executed small bronze sculptures, including "The Wounded Comrade", "The Nandi Spearmen", and "The Charging Herd". He wrote *In Brightest Africa* (1923).

A KEMPIS, Thomas. *See* Thomas a Kempis

AKENSIDE, Mark (1721–70), British poet and physician, born in Newcastle-upon-Tyne, and educated at the University of Edinburgh, Scotland, and the University of Leiden, the Netherlands He practiced medicine in London, and, after the accession (1760) of George III, (q.v.) to the throne of Great Britain, served as physician to the queen. Akenside is best known as the author of *The Pleasures of Imagination* (1744), a philosophical essay in blank verse that he began in his eighteenth year. The essay is characterized by an ease and charm rarely found in his later satires and mythological odes. A final revision of *The Pleasures* is included in a volume of his collected *Poems* (posthumously published, 1772)

AKHENATON. *See* Ikhnaton

AKIBA BEN JOSEPH (about 50–137) Jewish rabbi and martyr, resident in Palestine. During his youth, according to tradition, he was a shepherd. He began the study of the law at the comparatively advanced age of forty years, but he rose to a preeminent position as "the father of rabbinic Judaism". He regarded the Jewish leader Simon Bar Cocheba (q.v.), who headed the great Jewish revolt against Rome during the reign of Emperor Hadrian (q.v.), as the promised Messiah and applied to him the title "son of the star". Akiba was imprisoned for transgressing Hadrian's edict forbidding the practice and teaching of the Jewish religion; he was subsequently flayed to death in the ancient Palestinian city of Caesarea. Akiba is one of the "ten martyrs" named in the penitential prayers of the Jews.

Akiba laid the basis of the Mishnah (q.v.) by beginning the systematization of Jewish oral law. In addition he cultivated a method of scriptural exegesis that is a characteristic feature of Talmudic literature. He taught that love one has for one's fellow man is the central commandment, that man has free will, and that God's attitude toward the world is compounded of justice and mercy.

See also Talmud N.N.G.

AKIHITO, in full AKIHITO TSUGONIMAYA (1933–), crown prince of Japan, born in Tokyo, fourth child and first son of Hirohito (q.v.), Emperor of Japan He attended Gakushuin University, Tokyo In 1952 he was officially proclaimed heir to the throne of Japan In 1953 he represented his nation at the coronation of Elizabeth II (q.v), Queen of England Akihito married a commoner, Michiko Shoda (1935–), in 1959 and their first son was born in 1960

AKITA, city and seaport in Japan, capital of Akita Prefecture, on the Omono R., on the N W coast of Honshu Island, about 275 miles N W of Tokyo Oil refining, metalworking, and silk-textile manufacture are the principal industries Pop. (1970) 236,000

AKKA, *or* Tiki-Tiki, nomadic pygmy tribe dwelling in the Uele R. basin of the Republic of Zaire, and belonging to the Negrito branch of the Negroid race. The first European known to have encountered the Akka was the German explorer Georg August Schweinfurth (q v), who visited their tribal domain in 1870 The Akka range in height from about 4 to about 5 ft and are brown skinned. They have protruding jaws, lips, and stomachs. The chief occupations of the Akka are hunting game with traps and poisoned arrows, and collecting ivory and honey, which they exchange with surrounding tribes for iron weapons and foodstuffs. Their houses are round and are made of leaves and branches *See* Races of Mankind Racial Classification Negroid Race

AKKAD. *See* Sumer· *History*

AKMOLINSK. *See* Tselinograd

AKOLA, city of the Republic of India, in Maharashtra State, and capital of Akola District, about 140 miles S W. of Nagpur. Cotton is grown extensively in the district, and the city is one of the chief centers of the cotton trade of Maharashtra. Pop. (1971) 168,454

AKRON, city in Ohio, and county seat of Summit Co , on the Cuyahoga R , about 36 miles S of Cleveland. Transportation facilities include four railroads, airlines, and bus lines. The city is also a principal center of truck transportation. The site of Akron, a hilly region dotted with lakes, covers 54.1 sq mi and is 875 ft above sea level. Akron has an excellent system of public parks, comprising about 2700 acres, Portage Lakes State Park (2250 acres) is nearby. Points of interest in the city include the $150,000,000 Akron Expressway System; the Goodyear Air Dock, the largest aircraft hangar without interior columns in the world; and the Akron Municipal Airport, site of the Rubber Bowl, seating 35,000, in which the annual All-American Soapbox Derby is held. The University of Akron, founded as Buchtel College in 1870 and reorganized as a municipal university in 1913 and as a State university in 1967, is in the city Akron is the largest rubber-manufacturing center in the world; more than one third of the world production of crude rubber is absorbed by its factories. Printing, publishing, and the manufacture of automotive parts, heavy earth-moving equipment, synthetic rubber, wood products, fishing tackle, aircraft components, clay products, plastics, steel, aluminum, and breakfast foods are also important industries.

The site of Akron was first settled about 1825. The settlement was incorporated as a village in 1836, and six years later it became the county seat. In 1865 Akron was chartered as a city. The American industrialist Benjamin Franklin Goodrich (1841–88) established the first rubber factory in the city in 1869. Pop. (1960) 290,351; (1970) 275,425.

AKSAKOV, Russian family, members of which were writers and ardent leaders of the 19th-century Slavophile movement. The movement espoused the concept of the superiority of Eastern European culture over that of the West. Among the most important members of the family were the following.

Sergei Timofeevich Aksakov (1791–1859), born in Ufa, and educated at the University of Kazan. For several years after completing his education he was a civil servant in Saint Petersburg (now Leningrad). He returned to the region in which he was born in 1815 and within ten years lost his fortune through mismanagement of his estate. In 1825 he secured a post as a censor in Moscow. His home there became a prominent gathering place for Slavophile enthusiasts. In 1832 he became friendly with the Russian writer Nikolai Gogol (q.v.), who inspired him to embark on a literary career. Aksakov's two most widely read works, *Semeynaya Khronika* (1856; Eng. trans., *A Russian Gentleman*, 1917) and *Detskie gody Bagrova Vnuka* (1858; Eng. trans., *Years of Childhood*, 1916), are based in part on his childhood experiences on the eastern steppes of Russia. In addition to occupying an outstanding place in Russian literature, these works gave impetus to the development of realism in Russian literature.

Ivan Sergeevich Aksakov (1832–86), a leader of the Slavophile movement, son of Sergei Aksakov, born in Ufa, and educated in law in Saint Petersburg (now Leningrad). He founded and edited several magazines and newspapers supporting slavophilism. In 1878 he was exiled from Moscow because of his outspoken opposition to the Berlin Treaty (*see* BERLIN, CONGRESS OF), but was soon permitted to return. From 1880 to 1885 he was editor of *Rus*, the official publication of the Slavophile Party.

AKTYUBINSK, city of the U.S.S.R., in the Kazakh S.S.R., capital of Aktyubinsk Oblast, about 125 miles S.E. of Orenburg. Manufactures include chemicals, flour, metal products, and X-ray equipment. Pop. (1970 est.) 150,000.

AKUTAGAWA, Ryunosuke (1892–1927), Japanese author, born in Tokyo and educated at the University of Tokyo. His first published story, "Rashomon" (1915; Eng. trans., 1952), was combined with a later story, *"Yabu no naka"* (1921; Eng. trans., "In a Grove", 1952), to form the basis for the successful Japanese film *Rashomon* (1950). All demonstrate Akutagawa's interest in the feudal period.

AKYAB. *See* SITTWE.

ALABAMA, one of the East South-Central States of the United States, bounded on the N. by Tennessee, on the E. by Georgia, on the S. by Florida and the Gulf of Mexico, and on the W. by Mississippi. Alabama is rectangular in shape, measuring about 280 mi. from N. to S. and about 200 mi. from E. to W.

Area (29th State in rank)	51,609 sq. mi.
Land	50,708 sq. mi.
Inland water	901 sq. mi.
Population	(1970, 21st in rank) 3,444,165
	(1960, 19th in rank) 3,266,740
	(1950) 3,061,743
Altitude	sea level to 2407 ft.
Capital	Montgomery (1970) 133,386
Largest city	Birmingham (1970) 300,910
Entered Union (22nd State)	Dec. 14, 1819
Nickname	The Heart of Dixie
Motto	*Audemus Jura Nostra Defendere* (We Dare Defend Our Rights)
Song	"Alabama"
Tree	southern pine
Flower	camellia
Bird	yellowhammer

THE LAND

The highest region of Alabama is in the N.E., where the Appalachian Mts., the Cumberland Plateau (qq.v.), and the Piedmont Plateau extend into the State. Ranges of this area are the Sand Mts., Lookout Mts., and Talladega Mts. The highest point of the State is Cheaha Mt. (2407 ft.) in the E., in Cheaha State Park, S. of Anniston. A geological boundary separates the Appalachian region from the sloping Gulf coastal plain, running from the N.W. corner in a curving line to Phenix City on the Georgia border.

Rivers and Lakes. The rivers of Alabama comprise three groups: the Tennessee R., the Mobile R. and its tributaries, and other rivers that empty into the Gulf of Mexico. The Tennessee R. enters Alabama in the N.E. and makes a broad loop across the State, flowing out in the N.W. corner. Its course is marked by dams and artificial lakes of the Tennessee Valley Authority (q.v.), including Guntersville, Wheeler, and Wilson dams and lakes. The Tombigbee R. enters Alabama in the west-central section and receives the Sipsey,

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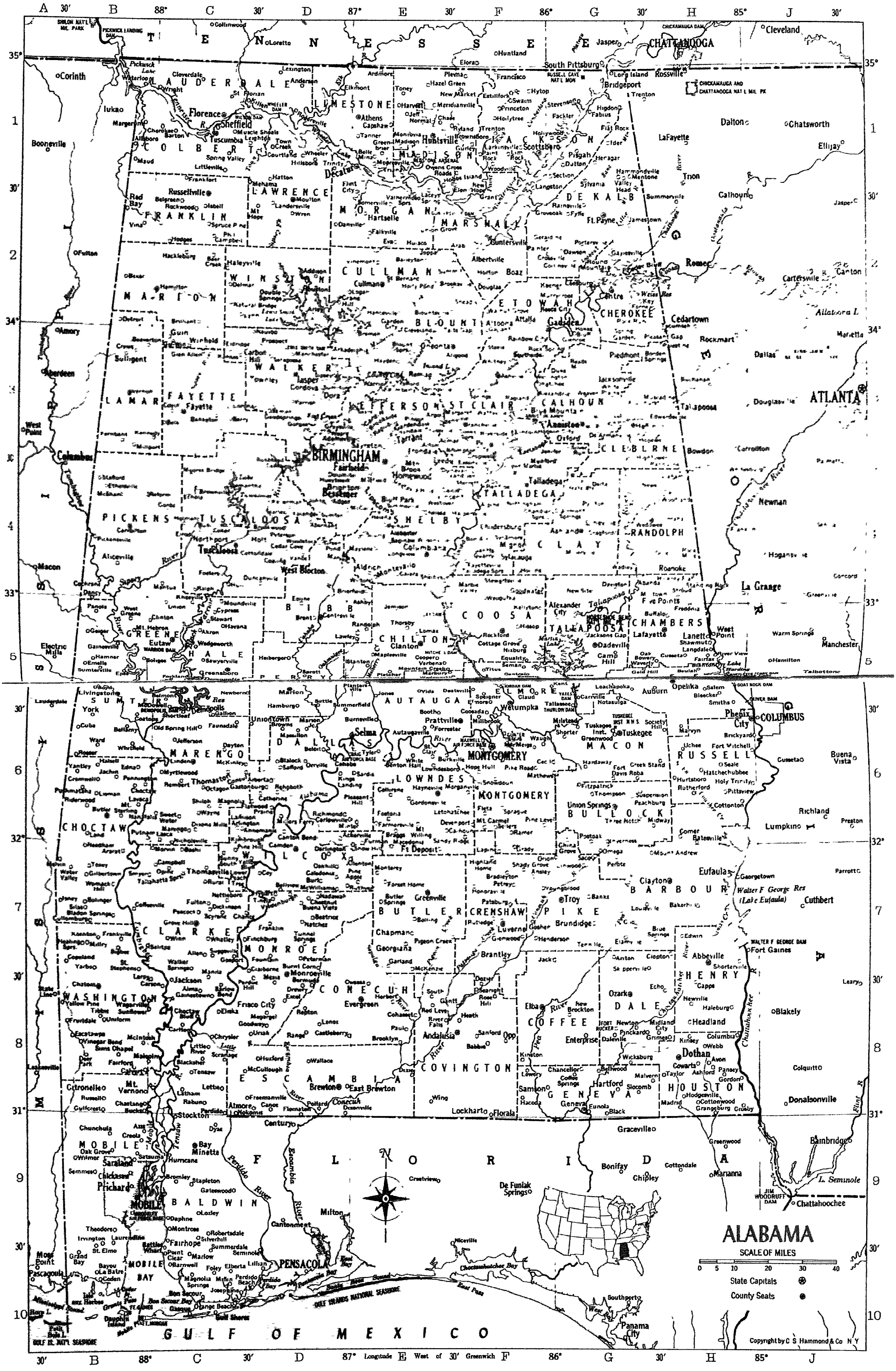
ALABAMA
SCALE OF MILES
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State Capitals
County Seats
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LIMESTONE
MADISON
JACKSON
COLBERT
LAWRENCE
MORGAN
MARSHALL
DE KALB
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BARBOUR
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COFFEE
DALE
HENRY
WASHINGTON
ESCAMBIA
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MONTGOMERY
MOBILE
Huntsville
Tuscaloosa
Gadsden
Anniston
Dothan
Selma
Decatur
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○ County Seat.

Black Warrior, and Alabama rivers. The Alabama R., with its tributaries, the Coosa, Tallapoosa, and Cahaba rivers, drains a larger area of the State than any other river; it joins the Tombigbee about 44 miles N. of Mobile to form the Mobile R. The Conecuh, Choctawhatchee, and Chattahoochee rivers flow S. into the Gulf of Mexico, the last-named river forming part of the Alabama-Georgia border. Other artificial lakes in Alabama are Martin Lake on the Tallapoosa R., Lay and Mitchell lakes on the Coosa, and Bankhead Lake on the Black Warrior.

Climate. Alabama has a temperate climate, which becomes subtropical near the coast. The summers are long, hot, and humid, with little day-to-day temperature change. In the N.E., higher altitudes help to cool the summer nights, and from late June through mid-August occasional afternoon thundershowers bring cool breezes. Winters are normally mild, the coldest months being December, January, and February. The highest recorded temperature in the State was 112° F. (at Centerville); the lowest, –18° F. (at Valley Head). Precipitation is almost entirely in the form of rain, snow falling in the N. counties only about twice a year. The heaviest rains occur from December to April, and droughts may occur during the growing season from late April through October. Rivers in Alabama overflow about once a year, with March the month of greatest flood frequency. The average annual number of days with measurable precipitation ranges from 118 at Birmingham to 111 at Mobile and 113 at Montgomery.

Climate	Birmingham	Mobile	Montgomery
Normal temperatures (in ° F.)			
January maximum	54.3	61.1	57.9
January minimum	34.1	41.3	37.1
July maximum	90.3	90.5	90.5
July minimum	69.5	72.6	71.5
Annual Mean	62.4	67.4	64.8
Normal precipitation (in inches)			
Wettest month	6.17	8.86	6.02
Driest month	2.58	2.55	2.24
Annual Mean	53.23	66.98	49.86
Latest frost	Mar. 19	Feb. 17	Feb. 27
Earliest frost	Nov. 14	Dec. 12	Dec. 3
Mean number of days between latest and earliest frosts	241	298	279

Plants and Animals. Some 4500 types of plants, shrubs, and trees are found in Alabama, and nearly all are native to the State. Forests cover about 63.5 percent of the area. Of about 125 kinds of trees, pines are the most common. Among other important trees are oak, hickory, gum, cypress, American holly, and southern magnolia. Trees not native to the area include tung and citrus.

More than 150 species of shrubs include, in the N. part of the State, rhododendron and mountain laurel, and in the S., native azalea, sumac, and yaupon, or cassina. Native grasses number more than 200, including cane found along the river banks. Mosses, ferns, vines, and wild flowers grow in profusion.

Alabama has many kinds of mammals, including white-tailed deer, wildcat, opossum, raccoon, red fox, mink, beaver, skunks, muskrat, nutria, gopher, mole, rabbits, and squirrels.

Both freshwater and saltwater fish abound. The most common freshwater fish are catfish, carp, shad, bream, trout, bass, and crappie. Among the saltwater fish are mullet, red snapper, flounder, mackerel, whiting, and grouper. Several varieties of migratory fish are found, including tarpon, pompano, king mackerel, bluefish, bonito, dolphin, redfish, and sturgeon. Oysters, shrimp, and crabs are abundant. Of the forty species of snakes in Alabama, only one coral snake, three kinds of rattlesnakes, the copperhead, and the cottonmouth are poisonous. Alligators are found in the swamps and bayous of the S.

Parks, Forests, and Other Places of Interest. Alabama has four national forests, comprising more than 600,000 acres. William B. Bankhead National Forest, near Cullman, has limestone gorges, natural bridges, the Lewis Smith Reservoir, and a wildlife refuge. Conecuh National Forest, near Andalusia, offers fishing and hunting. Talladega National Forest, near Anniston, contains the Payne Lake Wildlife Management Area and the Skyway, a scenic drive. Tuskegee National Forest, near Tuskegee, has a large pine plantation. Other places of interest under the supervision of the National Park Service are Horseshoe Bend National Military Park (q.v.) in Tallapoosa County, the site of the last great battle in the Creek Indian campaign (1813–14); Natchez Trace National Parkway, in the N.W. (partly in Mississippi and Tennessee), which follows the general route of an old Indian trail between Nashville and Natchez; and Russell Cave National Monument (q.v.), near Bridgeport, a cave containing an almost continuous archeological record of human habitation from at least 6000 B.C. to about 1650 A.D.

Alabama maintains numerous State parks, including Gulf State Park, Fort Morgan State Park, and Meaher State Park, all in Baldwin County, Chewacla State Park, in Lee County, Oak Mountain State Park, the largest in the State, in Shelby County; Cheaha State Park, near Talladega; Little Mountain State Park, in Marshall County; De Soto State Park, on Lookout Mt., Monte Sano State Park, near Huntsville; and Joe Wheeler State Park, near Tuscumbia.

Places of historical interest include Fort Mims, in Baldwin County, which on Aug. 30, 1813, was the scene of one of the largest massacres of white settlers by Indians. Fort Toulouse, near Montgomery, was built by the French explorer and colonial administrator Jean Baptiste Lemoyne, Sieur de Bienville (q.v.), and was the site of Fort Jackson during the Indian War of 1813–14. Old Saint Stephens, capital of Alabama Territory in 1817, is in Washington County. In Montgomery are the first White House of the Confederacy, the residence of Confederate President Jefferson Davis (q.v.) during the early days of the Civil War; and the State Capitol, scene of the formation of the Confederate government in 1861. Mound State Monument, in Hale County, is on the site occupied by the prehistoric Indians known as Mound Builders (q.v.) and contains the tallest mound (nearly 60 ft.) in the U.S. Fort Tombecbe, the site of a fort built by Sieur de Bienville in 1736, is in Sumter County. Dauphin Island, near Mobile, is the site of an early French settlement.

French colonial architecture and the ornamental use of ironwork, especially in Mobile, and the numerous historic plantations such as Rosemount, near Boligee; Gaineswood and Thornhill, near Demopolis, Forks of Cypress, near Florence; and Jasmine Hill, near Montgomery, are also of interest. Magnolia Grove, home of Admiral Richmond Pearson Hobson (1870–1937), Spanish-American War hero, is in Greensboro. Garden pilgrimages are held in Birmingham in April and in Montgomery in May; the Azalea Trail Festival is an annual event in Mobile. The Bellingrath Gardens, popular throughout the year, are near Mobile. The U.S.S. *Alabama* is anchored in Mobile Bay as a World War II naval museum.

Sports. The many rivers, reservoirs, and lakes of Alabama provide a variety of freshwater game fish, including bass, bluegill, catfish, crappie, and pickerel. Saltwater fishing is excellent along the Gulf coast, with catches including spotted seatrout, red snapper, tarpon, and sailfish. Game animals hunted in the State include deer, rabbit, and wild turkey.

THE PEOPLE

According to the 1970 decennial census, the population of Alabama was 3,444,165, an increase of 5.4 percent over the 1960 population. The urban segment comprised 2,011,941 persons (58.4 percent of the total), compared with 54.8 percent in 1960. The rural segment comprised 1,432,224 persons (41.6 percent of the total), compared with 45.2 percent in 1960. Ethnically, the 1970 population was distributed as follows: white persons 2,533,831; nonwhites 910,334, including 903,467 Negroes, 2,443 Indians, and a sprinkling of Japanese, Chinese, Filipinos, and others. The percentage of native born residents was about 98.5; of foreign born, 0.5. The 1970 population density averaged 67.9 per sq.mi., compared with 64.2 in 1960.

The chief cities are Montgomery, the capital and fourth largest city, an agricultural and lumber trade center; Birmingham, the largest city, a center of the steel industry; Mobile, the second-largest city and the State's only seaport, a center of maritime and other industries; and Huntsville, the third largest city, a textile center and the site of George C. Marshall Space Flight Center.

Education. The public school system of Alabama was established in 1854. Education is compulsory for all children between the ages of seven and sixteen.

ELEMENTARY AND SECONDARY SCHOOLS. In the early 1970's public elementary schools numbered about 570 and public secondary schools, about 245. Enrollment was about 568,000 in elementary and 238,000 in secondary schools. Teachers in the public school system numbered about 16,000 in elementary and 17,000 in secondary schools. In the early 1970's private schools included about 135 elementary schools with about 17,000 students and 40 secondary schools with some 9000 students. Teachers in private schools numbered about 1400 in the late 1960's.

COLLEGES AND UNIVERSITIES. In the early 1970's Alabama had 49 institutions of higher learning, some 20 of which were privately supported. University and college enrollment totaled more than 103,000. State institutions include the University of Alabama, Auburn University (qq.v.); the University of South Alabama; the State universities of Florence, Jacksonville, and Troy; Alabama Agricultural and Mechanical University; Alabama State University, 18 junior colleges, and 27 vocational-technical schools. Private institutions include Athens College, Birmingham-Southern College, Samford University, Huntingdon College, Judson College, and Spring Hill College. Tuskegee Institute (q.v.) is a private institution that receives some State support.

Libraries and Museums. Of the several libraries in Alabama, the Birmingham Public and Jefferson County Free Library, with about 810,000 volumes, is considered one of the most outstanding in the South. Florence and Dadeville also have noteworthy libraries.

Among the many museums, of particular interest is the Edith Nourse Rogers Museum at the

The home of the president of the University of Alabama at Tuscaloosa Built in 1829, it is a fine example of the raised-portico style often seen in the South
State of Alabama

United States Women's Army Corps Center, in Fort McClellan, with a collection that provides a comprehensive history of the WAC. Others include the Regar Memorial Museum of Natural History, in Anniston; the Alabama Museum of Natural History, in University; the Birmingham Museum of Art; and, in Montgomery, the Montgomery Museum of Fine Arts, with a collection of Indian relics and historical items, and the Alabama Department of Archives and History, with documents relating to State history.

THE ECONOMY

Alabama has a diversified economy. The per capita personal income in 1976 was $5105, compared with the U.S. average of $6441. Agricultural workers made up about 7 percent of employees, and nonagricultural workers were employed, in descending order of numbers, in manufacturing, government, wholesale and retail trade, service industries, construction, transportation and public utilities, and finance, real estate, and insurance

Between 1970 and 1977 the State's population increased by about 7 percent, a bit more than the national average. Its percentage of working-age population was somewhat less than that of the U.S. as a whole. Civilian workers numbered 1,480,000 in the mid-1970's, a sizable proportion of them employed by the textile and primary metals industries. The Federal government employed 56,500.

Manufacturing. Industrial growth in Alabama has been rapid in recent decades, largely because of the abundance of mineral resources and labor and the availability of waterpower and inland navigable waterways. Industrial growth during the period 1964-69 totaled $2 4 billion and added 112,000 new jobs. According to a recent survey of manufactures, production workers in Alabama in the mid-1970's totaled 313,000. Most of them were employed in textile mills, apparel manufacture, primary metals industries (iron and steel), and in lumber and wood products plants About one fifth of the workers were employed in the Standard Metropolitan Statistical Area of Birmingham; a little less than half of these worked in the city of Birmingham Other manufacturing centers are Huntsville, Mobile, Columbus, Tuscaloosa, and Gadsden. The Birmingham-Bessemer-Gadsden district constitutes one of the major iron- and steel-producing sections of the country. The value added by manufacture (*see* VALUE) in the largest industries totaled $1.19 billion for primary metals, $743,800,000 for paper and allied products, and $610,500,000 for food and food products The textile and apparel manufacturing industries, although most important in terms of numbers of workers employed, were of lesser importance in terms of value added, accounting for $501,900,000 and $464,300,000, respectively The value added by all manufacture in Alabama was about $6 62 billion annually

Agriculture. Alabama ranks twenty-sixth among all States in value of cash receipts from agriculture About 94,000 people are employed on some 77,000 farms covering 14,500,000 acres. The average size of a farm in Alabama is 188 acres The most important agricultural commodities are broiler chickens, cattle, soybeans, and eggs Alabama's total cash receipts from agriculture in the mid-1970's were about $1 62 billion, of which $993,226,000 came from livestock and $624,722,000 from crops. Poultry production has been the State's fastest growing agricultural enterprise, increasing by some 3000 percent since 1947. Alabama is seventh in the nation in cotton production and second in peanuts.

Fishing. Alabama has fisheries that provide significant catches of shrimp, oysters, crabs, mullet, and menhaden. The oyster and crab fisheries are centered in Mobile Bay and the Mississippi R estuary, shrimp are found in the same waters and in the Gulf of Mexico. The catch varies considerably from year to year; in the mid-1970's it was about 31,000,000 lb. annually, valued at about $21,000,000. About 2150 fishermen are employed in the State

Mining. Alabama ranks eighteenth among the States in value of mineral production. In the mid-1970's the annual value of minerals produced was about $969,000,000. The principal products, in order of value, are bituminous coal, petroleum, cement, and stone.

Energy. In the mid-1970's Alabama produced 56 6 billion kw hours of electric energy annually, more than half of it generated by private companies. The Tennessee Valley Authority and utility companies operated five nuclear-power reactors as well as four hydroelectric plants of more than 150,000-kw capacity.

Forestry. The forest land of Alabama is about two thirds softwoods and one third hardwoods. Primarily under private ownership, the forest land comprises some 21,700,000 acres. It produces a net annual cut of sawtimber of some 2.9 billion bd.ft.

Transportation. The first railroad in Alabama was the Tuscumbia Ry., inaugurated on June 12, 1832, and now part of the Southern Ry. In addition to the Southern, the State is served by several other Class 1 railroads; there are about 4500 mi of track in Alabama Rural and municipal roads total about 86,500 mi., Federally assisted primary and secondary roads total about 23,268 mi., including 898 miles in the Interstate Highway System In the mid-1970's Alabama was served by four international and three local and interstate airlines, there are 129 public and private airports The Tennessee R, which swings into and out of the State, is part of the Mississippi R system of waterways A section of the Gulf Intracoastal Waterway passes through Alabama. Navigable rivers flowing to the Gulf of Mexico include the Black Warrior Warrior-Tombigbee system, the Alabama and Coosa rivers, which join the Tombigbee, and the Chattahoochee R. Mobile, Alabama's chief port, ranks tenth in the nation

Communications. The first newspaper in Alabama was the Mobile *Centinel*, founded in 1811. In the mid 1970's the State had 24 daily newspapers and 17 Sunday papers The largest paper in the State is the Birmingham News. Other important papers are the Birmingham *Post Herald*, the Mobile *Press Register*, the Montgomery *Advertiser* and *Alabama Journal*, the Huntsville *Times*, the Decatur *Daily*, the Anniston *Star*, the Florence *Times Tri Cities Daily*, the Tuscaloosa News, the Selma *Times Journal*, and the Gadsden *Times* Some 217 radio stations and 26 television stations broadcast in the State One of the earliest radio stations was WAPI in Birmingham, which went on the air in 1922

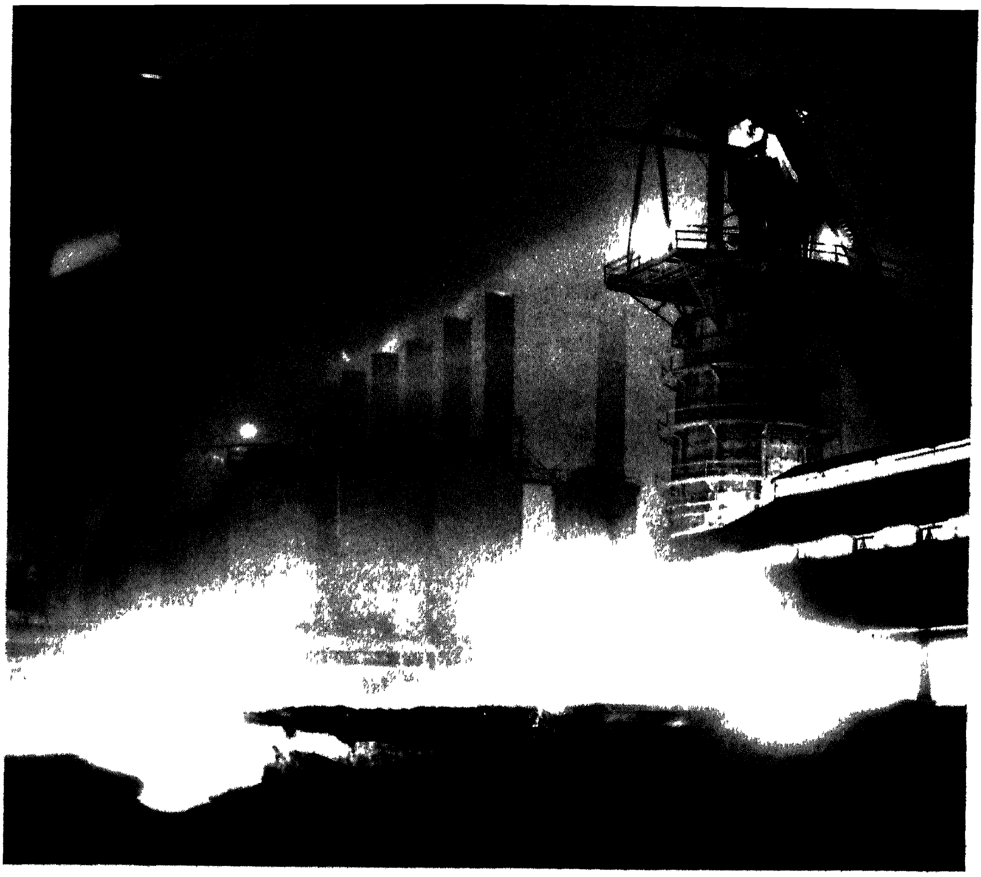
GOVERNMENT

Alabama is governed under the constitution of 1901, as amended Executive authority is vested in a governor, a lieutenant governor, an attorney general, and a secretary of state, all elected for four-year terms, and other elected and appointed officials Legislative authority is exercised by the Senate with thirty-five members and the House of Representatives with 105 members, all elected for four year terms. The legislature meets biennially in odd-numbered years Judicial authority is exercised by a nine-member supreme court, a court of appeals, circuit courts, and various local and special courts.

Alabama is represented in the United States Congress by two Senators and seven Representatives.

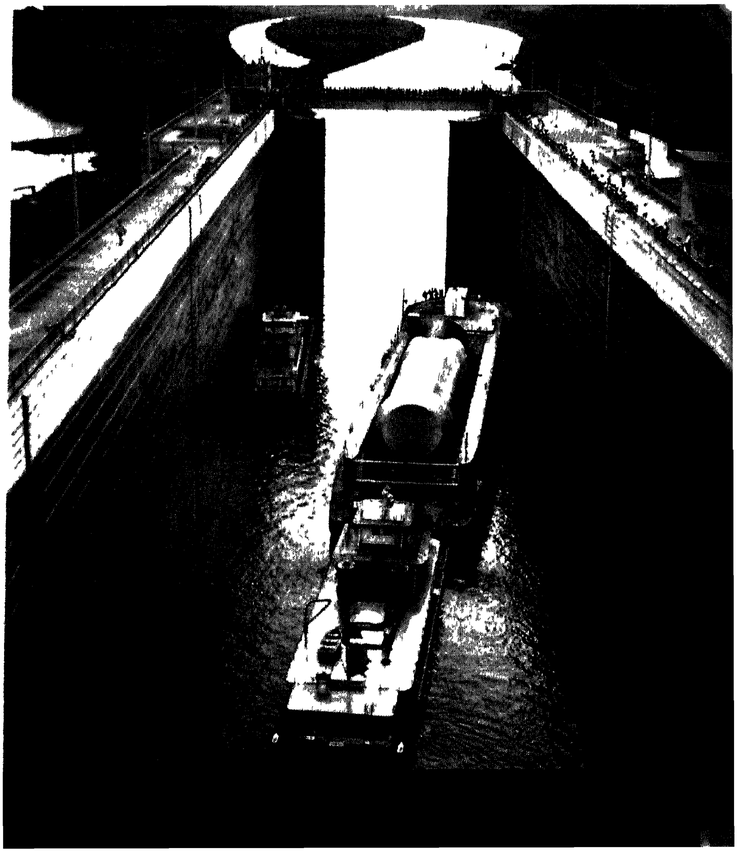
Local Government. Alabama is divided into sixty-seven counties The principal county officials include the probate judge, commissioners, superintendent of education, and sheriff.

Voting Qualifications. Suffrage is extended generally to all U.S. citizens eighteen years of age who meet the residence requirements (thirty days in the State)



A Birmingham steel mill operating at night. The making of iron and steel is one of the oldest and most important industries in Alabama

Birmingham Chamber of Commerce



A barge passing through a lock of the Wilson dam, carries a Saturn booster rocket from the Marshall Space Flight Center at Huntsville, Ala., to Cape Kennedy, Fla.

HISTORY

In prehistoric times the region comprising present-day Alabama was inhabited by Indians who lived in a Stone Age culture Many tribes built mounds as burial places and sometimes for defense purposes Some of the mounds are still standing, notably in Moundville, Hale County.

The first white men to penetrate the region were the Spanish explorers Alonso de Piñeda, who entered what is now Mobile Bay in 1519, and Pánfilo de Narváez (1480?–1528), who in 1528 explored the southern part of the region Hernando de Soto (q.v) reached a site near the present-day city of Mobile on Oct. 18, 1540, after winning a costly victory over the Choctaw Indians in the battle of Maubila.

The first permanent settlement was established by Jean Baptiste Lemoyne, Sieur de Bienville (q.v.), French governor of Louisiana, when, in 1702, he transferred the seat of the colony from Biloxi to Mobile Bay. Not until 1711, however, did the French lay out the site of present-day Mobile, which with the surrounding territory was then considered part of Louisiana. In 1763 France ceded the territory to Great Britain under the Treaty of Paris, the peace settlement that terminated the French and Indian War. In 1783 Great Britain ceded the southern part of the region, including West Florida, to Spain. All of southern Alabama except the region projecting south of the 31st parallel was ceded to the United States by Spain in 1795. In 1813 the U.S. annexed the remainder of Spanish-held Alabama, basing its action on the provisions of the Louisiana Purchase (q.v.). Alabama was organized as a Territory in 1817 and admitted as a State in 1819.

On Jan. 11, 1861, without a popular vote having been held, Alabama seceded from the Union and joined the Confederate States of America (q.v.). The Confederate government was organized on Feb. 4, 1861, at Montgomery, which served as the capital of the Confederacy until June of that year After the close of the Civil War a provisional governor was appointed in June, 1865, by U.S. President Andrew Johnson (q.v.).

At a constitutional convention (September, 1865), the act of secession was repealed, a new State constitution was adopted, and slavery was abolished. Following the November elections, the national government recognized the State legislature; the governor-elect was inaugurated in December after the State had ratified the Thirteenth Amendment to the Constitution of the United States (q.v.). The United States Congress, however, under the influence of the "radicals" (as the Republicans were known), refused to seat the newly elected Alabama delegations The State was placed under Federal military control on March 2, 1867. In June, 1868, Congress readmitted Alabama to the Union after a new State constitution had been drawn up and the Fourteenth Amendment to the Constitution had been ratified. The Fifteenth Amendment was ratified by Alabama on Nov 16, 1870.

During the Reconstruction (q.v) period following the Civil War, Alabama was torn by party dissension and extravagance and dishonesty in official circles. The election of the Democratic leader George S Houston as governor in 1874 heralded the end of the Reconstruction period

Following the restoration of home rule in Alabama, the State entered an era of industrial development that has characterized its history to the present time. The decade between 1880 and 1890 saw the iron and steel industry rise to a dominant position The first blast furnace in Alabama began operation in Birmingham in 1880, and eight years later steel was rolled at Bessemer This period was one also of rapid development in coal mining The following decade, 1890 to 1900, was a period of rapid growth of the cotton textile industry

Farm tenancy was a serious problem between 1875 and 1900. The basic difficulties were the prevalence of unskilled laborers and the scarcity of money and credit The landowners, who had little money, worked out share arrangements with their tenants, who knew no way to make a living except farming. As late as 1935, sixty-four out of 100 Alabama farmers were sharecroppers. Federal aid plus the growth of private industry and its demand for labor greatly reduced farm tenancy By 1941 Alabama agriculture had reached a turning point. Since that year decreases have occurred in the number of farmers and farms and the total farm acreage; but farm income and size, value of crops, and mechanization have increased

Following the 1954 decision of the Supreme Court of the United States (q v.) on school segregation, Alabama politics was dominated by the race issue In 1956 the Rev. Martin Luther King, Jr (q.v.), emerged as the leader of a bus boycott in Montgomery that contributed to the ending of so-called Jim Crow segregation laws. King's efforts in Birmingham and Selma produced violence that attracted national attention and contributed to the passage of the 1965 Civil Rights Act In reaction to Federal intervention, white Alabamians turned to the leadership of

George Corley Wallace (q v.), who served as governor from 1963 to 1967 and as adviser to his wife, Lurleen Burns Wallace (1926–68), who was elected in 1966 Wallace formed a third party, the American Independent Party, and ran unsuccessfully for President in 1968 Wallace again was elected governor in 1970, and he was reelected in 1974.

Both in State and national politics, Alabama has been a stronghold of the Democratic Party The Democrats carried the State in every Presidential election from 1876 to 1960 except in 1948 Because they opposed the civil-rights program of President Harry S Truman (q v.), about half of the Alabama delegation left the National Convention of the Democratic Party in 1948 These delegates later joined Democrats from twelve other Southern States to form the States' Rights Democratic Party. In the election the regularly elected Democratic electors in Alabama voted for the States' Rights candidates. But beginning in 1964, the State's voting pattern changed dramatically, when Barry M Goldwater became the first Republican Presidential candidate to carry Alabama since 1872.

In the early 1960's Alabama entered a period of great social and economic change. There have been steady efforts to attract industry to the State; to improve health, educational, and other social and economic services; to seek greater interracial cooperation; and to enlarge Alabama's transportation network. These efforts have been coupled with improved employment opportunities for Blacks, notably in the State's public service sector. Although race relations remain an important issue, Alabama's Blacks are slowly gaining an ever stronger voice in State and local politics.

ALABAMA, one of the principal rivers of the State of Alabama, formed by the junction of the Coosa and Tallapoosa rivers at a point 10 miles N.E of the city of Montgomery. It is about 315 mi. long, and is navigable for its entire length. The Alabama joins the Tombigbee R. to form the Mobile R., which flows into Mobile Bay.

***ALABAMA* CLAIMS,** series of claims for indemnity made by the United States upon Great Britain in the winter of 1862–63, during the American Civil War. The claims were made to compensate the U.S. for damages inflicted on American property by the Confederate steamship *Alabama,* a 1040-ton vessel that was built at Birkenhead, England. Just before the British government issued an order calling for her detention in port, the ship put to sea, became a raider, and captured or destroyed seventy U.S. ships. When the *Alabama* reached Cherbourg, France, for refitting on June 11, 1864, the U.S warship *Kearsarge* engaged her in battle outside the port and succeeded in sinking her.

The *Alabama* claims were not completely settled until 1885 The U.S claims were based chiefly on the alleged failure of the British government to prevent the building of the *Alabama* and other Confederate ships, and on the furnishing of supplies to the Confederate ships at British ports A tribunal of arbitrators, appointed by representatives of the U S, Great Britain, Italy, the Swiss Confederation, and Brazil, met in Geneva from 1871 to 1872, and decided that Great Britain should pay the U S damages of $16,145,830. Subsequently two courts of commissioners, appointed by the Congress of the U.S. sat (1874–76 and 1882–85) to determine the distribution to injured individuals and firms of the funds received through the *Alabama* claims Congress also determined the distribution of other funds, included within the award of the Geneva tribunal, based on depredations by the Confederate privateerships *Florida* and *Shenandoah.*

ALABAMA POLYTECHNIC INSTITUTE. *See* AUBURN UNIVERSITY

ALABAMA, THE UNIVERSITY OF, a system of three coeducational State-controlled institutions of higher education, with campuses at University, near Tuscaloosa, Birmingham; and Huntsville. The university was established in 1820 and opened in Tuscaloosa in 1831. In 1943 a medical college was established in Birmingham, and in 1966 a branch campus in Huntsville In 1969 the three campuses received autonomy, but a single board of trustees was retained. The Tuscaloosa campus comprises colleges of arts and sciences, education, commerce and business administration, community health sciences and engineering; the division of continuing education; graduate school; graduate school of library service; The New College; and schools of home economics, law, mines, and social work. At Birmingham, the major divisions are the Medical Center, with schools of community and allied health resources, dentistry, medicine, nursing, optometry and the university hospitals and clinics; and the University College, with schools of arts and sciences, business, education, and engineering The Huntsville campus includes schools of nursing and allied health sciences, humanistic studies, and science and engineering, and graduate and research studies, as well as a division of continuing education. Degrees of bachelor, master, and doctor are granted. In 1972 the libraries housed more than 1,500,000 bound volumes. Student enrollment in

1972 totaled 26,255, the faculty numbered 1861, and the total endowment was about $18,500,000.

ALABAMINE, former name of the element astatine (q.v.)

ALABASTER, name of two marblelike minerals. One variety, Oriental alabaster, was extensively used by the ancient Egyptians. It is a variety of calcite (q.v.), with hardness 3; it is usually white and translucent, but is often banded with dark or colored streaks. The other mineral, called modern alabaster, is a variety of gypsum (q.v.), usually snow-white in color with a uniform, fine grain. Modern alabaster is softer (hardness 1.5) than Oriental alabaster, and is easily carved into intricate shapes. Deposits of fine gypsum alabaster are found in Italy and England.

ALACOQUE, Saint Marguerite Marie (1647–90), French nun, born in Lauthecourt, France. She attributed her recovery from paralysis to the Virgin Mary, and entered the convent at Paray-le-Monial in 1671. Her visions of Christ, in which He revealed to her His bleeding and compassionate heart, gave impetus to the modern Roman Catholic practice of devotion to the Sacred Heart. She was beatified in 1864 and canonized in 1920; her feast day is Oct. 17.

ALADDIN, hero of the story "Aladdin and the Wonderful Lamp" in the Oriental folklore collection known as the *Arabian Nights* (q.v.). Aladdin, a poor Oriental boy, comes into possession of a magic lamp. By rubbing it, he can always summon the genie of the lamp, who fulfills such extravagant demands as winning Aladdin a princess as his bride and building a magnificent palace in a single night. Later incidents in the tale include the loss of the lamp to a cunning African magician. Eventually, the magician is slain and the lamp recovered, and Aladdin and the princess are restored to their palace.

ALAI MOUNTAINS. *See* Alay Mountains

ALAIN DE LILLE *or* **ALANUS AB INSULIS** *or* **ALANUS DE INSULIS** (1114?–1203?), Flemish theologian and philosopher, famous for the extensiveness of his knowledge. He received his name from the town of Lille, Flanders (now France), probably his birthplace. Comparatively little is known of his life. He lived at Montpellier, France, and eventually entered a Cistercian monastery. He wrote, chiefly in verse, on alchemy, natural philosophy, and theological subjects. His works include *De Planctu Naturæ,* (about 1160–70; Eng. trans., *The Complaint of Nature,* 1908), a satire on human vices, and *Anticlaudianus* (about 1182, Eng. trans., 1935), a treatise on arts and morals.

ALAIN-FOURNIER, pen name of HENRI ALAIN FOURNIER (1886–1914), French writer, born in La Chapelle-d'Angillon. He was the author of only one novel, *Le Grand Meaulnes* (1913, Eng. trans., *The Wanderer,* 1958), which with its mystic overtones and spiritual quality differed greatly from the realistic and naturalistic fiction of his contemporaries and exerted great influence on succeeding writers. His promising career was cut short by World War I; he was reported missing after the fighting of Sept. 22, 1914, in France, and was presumed dead. Most of his writing was published after his death. *Miracles* (1924) is a collection of his early verse and prose, much of which had been published previously in various periodicals.

W.F.

ALAJUELA, city in Costa Rica, and capital of Alajuela Province, on the slope of the 8895-ft. Poás volcano, about 13 miles W. of San José. Sugar and coffee are grown in the surrounding area and the city serves as an important marketplace for both of these commodities. Pop. (1972) 30,525.

ALAMANCE CREEK, BATTLE OF. *See* Regulators, The

ALAMANNI *or* **ALEMANNI,** confederacy of German tribes inhabiting the region (called Alamannia) between the Main and the Danube rivers in the 3rd century. They invaded Gaul several times and, early in the 5th century, conquered the territory which now comprises Alsace and a large part of Switzerland. In 495 they were conquered by Clovis I (q.v.), King of the Salian Franks, and the southern part of their territory was included in the duchy of Alamannia. The modern name for Germany in many Romance languages (Fr. *Allemagne;* Sp. *Alemania*) is derived from the name of these tribes.

ALAMEDA, city of California, in Alameda Co., on an island at the eastern or mainland side of San Francisco Bay, 12 miles E. of San Francisco. The city has excellent port facilities, including 5½ mi. of waterfront on deep water. It is connected by the Alameda-Oakland Tunnel (vehicular) and four bridges with neighboring cities, including Oakland. Oakland and San Francisco are connected by the San Francisco Bay Bridge. Although largely residential, Alameda has shipbuilding yards, aircraft repair facilities, plants manufacturing steel products, and a shipping depot. The city is the site of a United States naval air station, a U.S. Coast Guard base, a U.S. Army supply depot, and a training school of the U.S. Maritime Commission. Alameda was incorporated in 1854. Pop. (1960) 63,855; (1970) 70,968.

ALAMO, THE, former Franciscan mission in San Antonio, Texas, erected about 1722, later used as a fort, and now preserved as a State monument. The Alamo was the site of the most heroic episode of the Texan war of independence against Mexico (*see* TEXAS *History*). On Feb. 23, 1836, a Mexican force of about 4000 men commanded by Antonio Lopez de Santa Anna (q.v.), general and later president of Mexico, reached the outskirts of San Antonio, which had been captured by the Texan insurgents the previous December The San Antonio garrison, only 155 men under the command of Colonel William Barrett Travis (q.v.), withdrew to the Alamo. Santa Anna deployed his troops around the structure and, when his artillery arrived, launched an intensive assault The Texans, who were reinforced by 32 men on March 1, withstood the Mexicans until March 6, when the enemy succeeded in breaching the mission walls. Travis, his chief aides, including the American frontiersmen David ("Davy") Crockett and James Bowie (qq.v.), and the remainder of the garrison perished in the savage hand-to-hand struggle that followed. Of the 187 Texan defenders of the Alamo only six survived the siege, and General Santa Anna ordered each of them killed. At the subsequent battle of San Jacinto, in which Santa Anna was defeated, the battle cry of the Texans was "Remember the Alamo!"

ALAMOGORDO, town in New Mexico, and county seat of Otero Co., about 160 miles s.w of Albuquerque. The town is a trading and shipping center for the surrounding agricultural, livestock-raising, and forest region; local industrial plants include marble works, sawmills, and railroad repair shops. Among the points of interest in or near the town are White Sands National Monument (q.v.), the New Mexico School for the Blind, Lincoln National Forest, and Mescalero Apache Indian Reservation. Two local military installations, White Sands Proving Ground and Holloman Air Force Base are important weapons-testing centers. Alamogordo was founded in 1898 as a way station of the Southern Pacific Railway. Pop. (1960) 21,723; (1970) 23,035.

ÅLAND ISLANDS. *See* AHVENANMAA.

ALANS *or* **ALANI,** Iranian-speaking nomadic tribe of the ancient world, one of the peoples known as Sarmatians (q.v.). They first appeared in history north of the Caspian Sea; during the 2nd through the 4th centuries A.D they migrated westward, into the eastern provinces of the Roman Empire. They then divided into two groups. One group continued to migrate westward with the Germanic peoples, appearing in Gaul, Lusitania (Portugal), and finally in North Africa, where they merged with the Vandals (q v) The other group, wandering eastward, settled in the Caucasus Mts, where they have survived as the Ossetians (*see* OSSETS) of the Georgian S S R

ALANUS AB INSULIS. *See* ALAIN DE LILLE

ALARCÓN, Hernando de (fl 16th cent.), Spanish navigator and explorer in America On May 9, 1540, Alarcón sailed to the head of the Gulf of California and completed the explorations begun by the Spanish explorer Francisco de Ulloa (d 1540) in the preceding year During this voyage Alarcón proved to his satisfaction that there was no open-water passage between the Gulf of California and the South Sea, or Pacific Ocean Subsequently he entered the Colorado R, which he named the Buena Guia He was the first European to ascend the river for a distance considerable enough to make important observations. On a second voyage he probably proceeded past the present site of Yuma, Ariz. A map drawn by one of Alarcón's pilots is the earliest accurately detailed representation of the gulf and the lower course of the river.

ALARCÓN, Pedro Antonio de (1833–91), Spanish writer and politician, born in Guadix, and educated in Jesuit schools After a brief period of military service he entered the national legislature, called the Cortes, as deputy for his native town and worked for the restoration of the constitutional monarchy. In 1875, after the monarchy was restored, Alfonso XII (*see under* ALFONSO), King of Spain, made Alarcón a councilor. Alarcón was noted in his own time for his religious novels *El Escándalo* (1875; Eng. trans, *The Scandal,* 1945) and *La Prodiga* ("The Prodigal", 1882); the former, a defense of the Jesuits, caused widespread public discussion. He is now chiefly remembered, however, for his stories and sketches of rustic Spanish life and manners, the most important of which are collected in *El Sombrero de Tres Picos* (1874; Eng. trans., *The Three-Cornered Hat,* 1891) and *El Niño de la Bala* (1880; Eng. trans., *The Infant with the Globe,* 1955).

ALARCÓN Y MENDOZA, Juan Ruiz de (about 1581–1639), Spanish dramatist of the Golden Age, born in Mexico. He studied law in Spain, and in 1626 became a member of the Council of the Indies, the governing body for the Spanish colonies. He wrote about twenty plays; however, his main contribution to Spanish literature was the so-called comedies of ethics, plays with a moral purpose. He demonstrated how lying and slander bring disaster to the sinners in his best known plays *Las Paredes Oyen* ("Walls Have Ears") and *La Verdad Sospechosa* ("The Suspicious Truth"). The latter play served as the inspiration for *La Menteur* ("The Liar") by the French dramatist Pierre Corneille (q.v.). *See* SPANISH LITERATURE: *Renaissance and Golden Age*.

ALARIC, name of two kings of the Visigoths. *See* GOTHS: *Visigoths*.

Alaric I (about 370–410), King of the Visigoths (395–410), born on an island in the delta of the Danube R. During his youth the Visigoths migrated westward, under attack from the Huns (q.v.) at their rear. The Visigoths were used as auxiliary mercenary troops by the Roman emperor Theodosius I (q.v.), and Alaric first appears in history in 394 as a leader of these troops. Upon the death of Theodosius in 395 the Visigoths renounced their allegiance to Rome and acknowledged Alaric as king. He led his troops into Greece, sacked Corinth, Argos, and Sparta, and spared Athens only in return for a heavy ransom. After being defeated by the Roman general Flavius Stilicho (q.v.), Alaric retired with his plunder and secured from the new Eastern Roman emperor, Arcadius (377?–408), a commission as prefect of the Roman province of Illyricum. In 402 Alaric invaded Italy but was again defeated by Stilicho. Subsequently Alaric was persuaded to join forces with the Western Roman emperor Honorius (384–423), who was convinced that war with the Eastern Empire was inevitable.

When Arcadius died in 408 Rome abandoned its projected move against the East, whereupon Alaric demanded 4000 lb. of gold as indemnity. On the insistence of Stilicho, the Roman government agreed to this demand, but soon thereafter Honorius had Stilicho executed on charges of treason and abrogated the agreement. Alaric then invaded Italy, besieged Rome, and exacted a vast ransom. In 410 his troops captured and sacked the city. A disastrous storm forced Alaric to abandon his next campaign, an invasion of Sicily and North Africa.

Alaric II (d. 507), King of the Visigoths (484–507), succeeding his father Euric (d. 484). He ruled all Gaul beyond the Loire and Rhône rivers, and most of Spain. Alaric believed in the philosophy of Arianism (*see* ARIUS); his heresy gave the Frankish king, Clovis I (q.v.), who was an orthodox Christian, an excuse for making war on him. The forces of Alaric were completely routed near Poitiers, and he himself was overtaken and slain by Clovis. This defeat brought to an end the rule of the Visigoths in Gaul. Alaric is also known for the Breviary of Alaric (q.v.), an abstract of Roman laws and decrees prepared at his direction for use in his domains. This document is one of the existing sources for our knowledge of the application of Roman law in nations formed from the disintegrated Roman Empire.

ALASHAN, name of a desert and mountain range of S. central China. The mountains, with peaks as high as 11,000 ft., are on the borders of Kansu Province and Ningsia Hui Autonomous Region, about 150 miles SW. of the city of Ningsia. Northwest of the mountains and shielded by them from moisture-carrying air currents, is the totally arid Alashan Desert, inhabited only by nomadic tribesmen.

ALASKA, northernmost State of the United States, occupying the NW. extremity of North America and including two geologically related archipelagoes and a number of off-lying islands. Alaska is bounded on the N. by the Arctic Ocean, on the E. by Canada, on the SE., S., and SW. by the Pacific Ocean, and on the W. by the Bering Sea, Bering Strait, and the Arctic Ocean. The state measures about 1400 mi. from N. to S. and 2700 mi. from E. to W. The Alaskan archipelagoes are the Aleutian Islands (q.v.), a volcanic chain extending from the mainland to long. 170° 30' E., and Alexander Archipelago (q.v.), a group of about 1100 islands adjacent to the SE. coast of the mainland. The Pribilof Islands (q.v.) are a small and important Alaskan group, situated in the Bering Sea. Among the larger individual islands belonging to Alaska are Kodiak, Saint Lawrence, Nunivak, and Afognak islands.

Area (1st State in rank)	586,412 sq.mi.
Land	566,432 sq.mi.
Inland water	19,980 sq mi.
Population	(1970, 50th in rank) 302,173
	(1960, 50th in rank) 226,167
	(1950) 128,643
Altitude	sea level to 20,320 ft.
Capital	Juneau (1970) 6050
Largest city	Anchorage (1970) 48,081
Entered Union (49th State)	Jan 3, 1959
Motto	North to the Future
Song	"Alaska's Flag"
Tree	Sitka spruce
Flower	forget-me-not
Bird	willow ptarmigan

THE LAND

Bounded on three sides by water, and deeply indented, Alaska has a coastline about 3400 mi. in length. It is generally rectangular in shape, with two major projections: the Alaska Peninsula, with its geographical extension, the Aleutian Islands; and the Panhandle, which extends from the SE. body of the State along the border of British Columbia, Canada. Coastal indentations are deepest in the S., including Prince William Sound and Cook Inlet, between which lies the Kenai Peninsula; and in the W., including

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Akiak	F 2
Akutan	E 4
Alakanuk	E 2
Aleknagik	G 3
Allakaket	H 1
Ambler	G 1
Anaktuvuk Pass	H 1
Anchor Point	B 2
Anchorage ⊙	B 1
Anderson	H 2
Andreafski (Saint Marys)	F 2
Angoon	M 1
Aniak	G 2
Annette	N 2
Anvik	F 2
Arctic Village	K 1
Attu	J 3
Aurora Lodge	J 2
Barrow	G 1
Barter Island (Kaktovik)	K 1
Beaver	J 1
Beechy Point	H 1
Belkofski	F 3
Bell Island	N 2
Bethel	F 2
Bettles	H 1
Bettles Field	H 1
Big Delta	J 2
Big Lake	J 1
Birch Creek	J 1
Birchwood	C 1
Bird	C 1
Bluff	F 2
Boswell Bay	J 2
Buckland	F 1
Candle	F 1
Cantwell	J 2
Cape Pole	M 2
Caswell	B 1
Central	J 1
Chalkyitsik	K 1
Chaneliak	F 2
Chatanika	J 1
Chefornak	F 2
Chena Hot Springs	J 1
Chevak	E 2
Chickaloon	C 1
Chignik	G 3
Chignik Lagoon	G 3
Chignik Lake	G 3
Chisana	K 2
Chistochina	K 2
Chitina	K 2
Christian	J 1
Chugiak	C 1
Circle	K 1
Clam Gulch	B 1
Clarks Point	G 3
Clear	J 2
Cohoe	B 1
Cold Bay	F 3
College	J 1
Cooper Landing	C 1
Cooper Center	J 2
Cordova	D 1
Craig	M 2
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Cutoff (Huslia)	G 1
Deering	F 1
Delta Junction	J 2
Denali	J 2
Dillingham	G 3
Diomede	E 1
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Dutch Harbor	E 4
Eagle	K 2
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Edna Bay	M 2
Eek	F 2
Egegik	G 3
Eklutna	C 1
Ekuk	G 3
Ekwak	G 3
Elfin Cove	M 1
Elim	F 2
Ellamar	D 1
Emmonak	E 2
English Bay	B 2
Entrance Island	N 1
Eska	B 1
Ester	J 2
Eureka Lodge	C 1
Excursion Inlet	M 1
Fairbanks ○	J 2
False Pass	F 4
Fanshaw	N 1
Ferry	J 2
Fish Lake	B 1
Flat	G 2
Fort Glenn	E 4
Fort Yukon	J 1
Fortuna Ledge	F 2
Funter	M 1
Gakona	K 2
Galena	G 2
Gambell	D 2
Girdwood	C 1
Glennallen	D 1
Golovin	F 2
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Gordon	K 1
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Homer	B 2
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Hoonah	M 1
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Hughes	H 1
Huslia	G 1
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Hyder	P 2
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Iliamna	G 3
Itulilik	G 2
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Kake	M 1
Kakhonak	H 3
Kaktovik	K 1
Kalla	G 1
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Kaltag	G 2
Kanakanak	G 3
Karluk	H 3
Kashegelok	G 2
Kasigluk	F 2
Kasilof	B 1
Kenai	B 1
Ketchikan	N 2
Kiana	F 1
King Cove	F 4
King Salmon	G 3
Kipnuk	F 2
Kivalina	E 1
Klawock (Klawak)	M 2
Klukwan	M 1
Kobuk	G 1
Kodiak	H 3
Koggiung	G 3
Koliganek	G 3
Kotlik	F 2
Kotzebue	F 1
Koyuk	F 1
Koyukuk	G 1
Kustatan	B 1
Kvichak	G 3
Kwethluk	F 2
Kwigillingok	F 3
Kwinhagak (Quinhagak)	F 3
Larsen Bay	H 3
Levelock	G 3
Lignite	J 2
Long	G 2
Loring	N 2
Lower Tonsina	J 2
Manley Hot Springs	H 2
Manokotak	G 3
Marshall (Fortuna Ledge)	F 2
Matanuska	C 1
McGrath	H 2
Mekoryuk	E 2
Mentasta	K 2
Meshik	G 3
Metlakatla	N 2
Meyers Chuck	N 2
Miller House	J 1
Minto	J 2
Montana	B 1
Moose Pass	C 1
Mountain Point	N 2
Mountain Village	E 2
Naknek	G 3
Napaiskak	F 2
Napakiak	F 2
Napamute	G 2
Nash Harbor	E 2
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Neichina	C 1
Nenana	J 2
Newhalen	H 3
New Stuyahok	G 3
Newtok	F 2
Nikishka	B 1
Nikolai	H 2
Nikolski	E 4
Ninilchik	B 1
Nizina	K 2
Noatak	F 1
Nogamut	G 2
Nome ⊙	E 2
Nondalton	G 2
Noorvik	F 1
North Pole	J 2
Northway	K 2
Nulato	G 2
Nunapitchuk	F 2
Nushagak	G 3
Nyac	G 2
Old Harbor	H 3
Orca	J 2
Oscarville	F 2
Ouzinkie	H 3
Palmer	C 1
Pauloff Harbor	F 4
Paxson	J 2
Pelican	M 1
Perryville	G 3
Petersburg	N 2
Petersville	H 2
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Pilot Station	F 2
Pitkas Point	F 2
Platinum	F 3
Point Hope	E 1
Portage	C 1
Port Alexander	M 2
Port Althorp	M 1
Port Ashton	C 1
Port Chilkoot	N 1
Port Graham	B 2
Port Heiden	G 3
Port Lions	H 3
Portlock	C 2
Port Nellie Juan	C 1
Prudhoe Bay	J 1
Quinhagak	F 3
Rampart	H 1
Red Devil	G 2
Richardson	J 2
Ruby	G 2
Russian Mission	F 2
Saint George	E 3
Saint Marys	F 2
Saint Michael	F 2
Saint Paul Island	D 3
Salt Chuck	P 2
Sand Point	G 3
Savoonga	E 2
Saxman	N 2
Scammon Bay	E 2
Scotch Cap	E 4
Selawik	G 1
Seldovia	B 2
Seward	C 1
Shageluk	G 2
Shaktoolik	F 2
Sheldon Point	E 2
Shishmaref	E 1
Shungnak	G 1
Sitka	M 1
Skagway	M 1
Sleetmute	G 2
Soldatna	B 1
Solomon	F 2
Sourdough	J 2
South Naknek	G 3
Spenard	C 1
Stebbins	F 2
Sterling	B 1
Stevens Village	J 1
Stony River	G 2
Summit	J 2
Suntrana	J 2
Susitna	B 1
Sutton	C 1
Takotna	G 2
Talkeetna	B 1
Tanacross	K 2
Tanana	H 1
Tatitlek	D 1
Tazlina Glacier Lodge	C 1
Teller	E 1
Tenakee Springs	M 1
Tetlin	K 2
Tiekel	J 2
Tin City	E 1
Togiak	F 3
Tok	K 2
Tokeen	M 2
Toksook Bay	F 2
Tonsina	J 2
Tuluksak	F 2
Tunnel	C 1
Tuntutuliak	F 2
Tununak	E 2
Tyonek	B 1
Ugashik	G 3
Umiat	H 1
Unalakleet	G 2
Unalaska	E 4
Unga	F 3
Ungalik	F 2
Utopia	H 1
Uyak	H 3
Valdez	D 1
Venetie	J 1
Wainwright	F 1
Wales	E 1
Ward Cove	N 2
Washington Bay	M 1
Wasilla	B 1
Waterfall	M 2
West Petersburg	M 1
Wevok	E 1
White Mountain	F 2
Whittier	C 1

⊙ Senatorial district headquarters.

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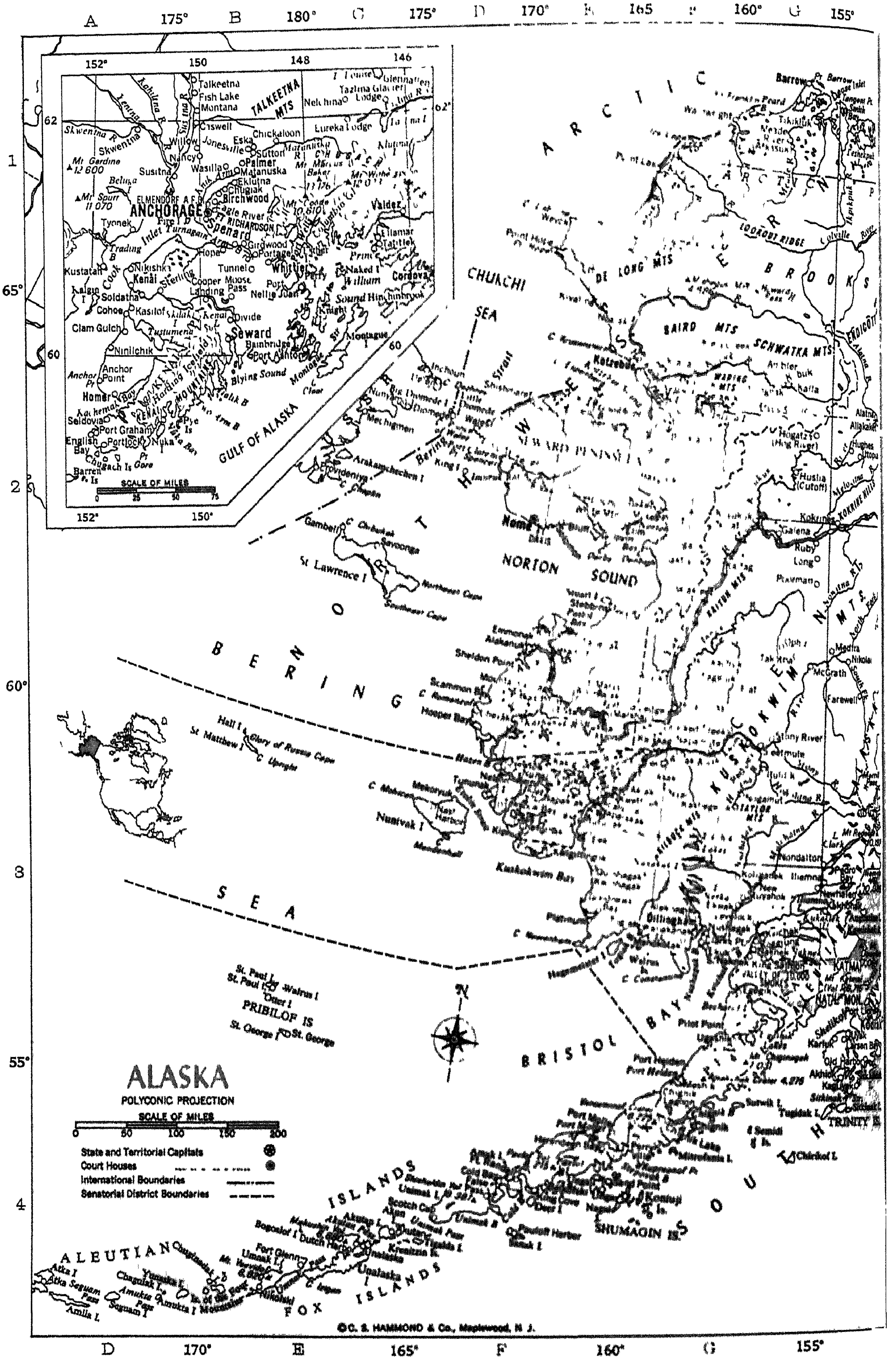
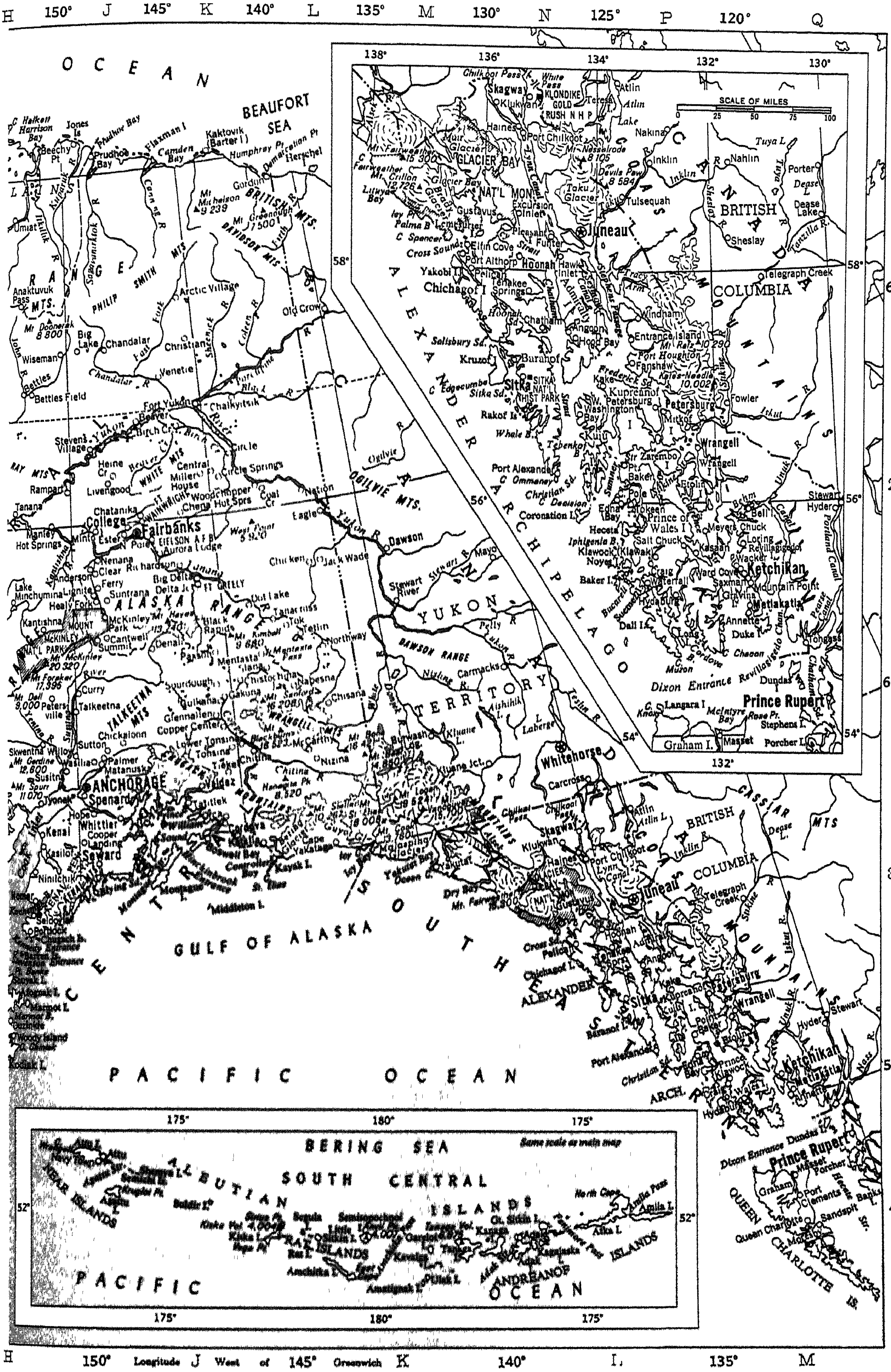

A
175°
B
180°
C
175°
D
170°
E
165
F
160°
G
155°
1
65°
2
60°
3
55°
4
D
170°
E
165°
F
160°
G
155°
ALASKA
POLYCONIC PROJECTION
SCALE OF MILES
0
50
100
150
200
State and Territorial Capitals
Court Houses
International Boundaries
Senatorial District Boundaries
152°
150
148
146
62
60
Talkeetna
Fish Lake
Montana
TALKEETNA MTS
Nelchina
Glennallen
Caswell
Chickaloon
Eureka Lodge
Skwentna R
Skwentna
Willow
Jonesville
Eska
Sutton
Palmer
Matanuska
Nancy
Wasilla
Mt Gerdine 12 600
Susitna
Eklutna
Chugiak
Birchwood
ELMENDORF A.F.B.
Mt Spurr 11 070
ANCHORAGE
Eagle River
FT RICHARDSON
Valdez
Tyonek
Spenard
Girdwood
Portage
Whittier
Tatitlek
Ellamar
Trading B
Hope
Tunnel
Kustatan
Nikishka
Kenai
Sterling
Cooper Landing
Moose Pass
Naked I
Cordova
Kalgin I
Soldatna
Prince William Sound
Cohoe
Kasilof
Kenai L
Divide
Clam Gulch
Tustumena L
Seward
Bainbridge I
Montague I
Ninilchik
Port Ashton
Anchor Point
Anchor Pt
Blying Sound
Homer
KENAI MOUNTAINS
Kachemak Bay
Seldovia
Port Graham
English Bay
Port Lock
Nuka Bay
Pye Is
Barren Is
Chugach Is
Pt Gore
SCALE OF MILES
0
25
50
75
GULF OF ALASKA
Cook Inlet
Turnagain Arm
ARCTIC
Barrow
Pt Barrow
Wainwright
Pt Hope
DE LONG MTS
BROOKS
LOOKOUT RIDGE
Colville
ENDICOTT
CHUKCHI SEA
BAIRD MTS
SCHWATKA MTS
Kotzebue
Bering Strait
Big Diomede I
Little Diomede
Wales
King I
SEWARD PENINSULA
Teller
Nome
Providenya
Arakamchechen I
Mechigmen
NORTON SOUND
Gambell
Savoonga
St Lawrence I
Northeast Cape
Southeast Cape
Galena
Ruby
Long
Kokrines
Hughes
Hogatza (Hog River)
Huslia (Cutoff)
KOKRINE HILLS
Unalakleet
St Michael
Stebbins
Emmonak
Alakanuk
Sheldon Point
Scammon Bay
Hooper Bay
BERING
Hall I
St Matthew I
C Upright
Glory of Russia Cape
KUSKOKWIM MTS
McGrath
Nikolai
Medfra
Farewell
Stony River
Mekoryuk
Nunivak I
C Mohican
Kuskokwim Bay
Bethel
TAYLOR MTS
Nondalton
Iliamna
SEA
Platinum
C Newenham
Dillingham
Naknek
Egegik
Walrus I
Hagemeister I
C Constantine
KATMAI NAT'L MON
VALLEY OF 10,000 SMOKES
St. Paul I
Walrus I
Otter I
PRIBILOF IS
St. George I
St. George
BRISTOL BAY
Port Heiden
Pilot Point
Ugashik
Chignik
Kodiak
Kodiak I
Old Harbor
Akhiok
Larsen Bay
Karluk
Sitkinak I
Tugidak I
TRINITY IS
Chirikof I
Semidi Is
Sutwik I
Port Moller
Perryville
Mitrofania I
Nagai I
SHUMAGIN IS
Sand Point
Unga
Popof I
Belkofski
Cold Bay
King Cove
Unimak I
Scotch Cap
Unimak Pass
Akutan I
Akun I
Tigalda I
Krenitzin Is
Unalaska
Unalaska I
Dutch Harbor
Bogoslof I
Fort Glenn
Umnak I
Nikolski
FOX ISLANDS
ISLANDS
ALEUTIAN
Atka I
Atka
Seguam Pass
Amlia I
Chagulak I
Yunaska I
Amukta Pass
Amukta I
Is. of the Four Mountains
SOUTH
N
©C. S. HAMMOND & Co., Maplewood, N. J.


H 150° J 145° K 140° L 135° M 130° N 125° P 120° Q
OCEAN
BEAUFORT SEA
Prudhoe Bay
Flaxman I
Camden Bay
Kaktovik (Barter I)
Humphrey Pt
Demarcation Pt
Herschel
Beechy Pt
Jones Is
Harrison Bay
Umiat
Mt Michelson 9 239
Mt Greenough 7 500
BRITISH MTS.
DAVIDSON MTS
PHILIP SMITH MTS
Arctic Village
Anaktuvuk Pass
Mt Doonerak 8 800
Big Lake
Chandalar
Christian
Wiseman
Bettles
Bettles Field
Venetie
Old Crow
Fort Yukon
Chalkyitsik
Beaver
Stevens Village
Birch Cr
Circle
Central
Circle Springs
Livengood
Rampart
Tanana
Manley Hot Springs
Chatanika
College
Fairbanks
Ester
Eielson A F B
North Pole
Aurora Lodge
Woodchopper
Chena Hot Sprs
Coal Cr
Nation
Eagle
OGILVIE MTS.
Ogilvie
Dawson
Chicken
Jack Wade
Nenana
Clear
Richardson
Anderson
Ferry
Big Delta
Delta Jc
Ft Greely
Lignite
Suntrana
Healy Fork
Lake Minchumina
Kantishna
MOUNT McKINLEY NAT'L PARK
McKinley Park
Mt McKinley 20 320
Mt Foraker 17 395
Cantwell
Summit
Denali
ALASKA RANGE
Mt Hayes 13 740
Black Rapids
Mt Kimball 9 680
Paxson
Mentasta Pass
Tok
Tetlin
Northway
Tanacross
Nabesna
Chistochina
Mt Sanford 16 208
Chisana
Gakona
Gulkana
Glennallen
Copper Center
Sourdough
WRANGELL MTS
Mt Blackburn 16 523
McCarthy
Nizina
Curry
Talkeetna
TALKEETNA MTS
Chickaloon
Sutton
Palmer
Matanuska
Wasilla
Willow
Skwentna
Susitna
Mt Gerdine 12 600
Mt Spurr 11 070
Tyonek
ANCHORAGE
Spenard
Lower Tonsina
Tonsina
Valdez
Tiekel
Chitina
Tatitlek
Cordova
Hope
Whittier
Cooper Landing
Seward
Kenai
Kasilof
Ninilchik
Homer
Seldovia
Katalla
Cape Yakataga
Kayak I.
Controller Bay
Icy B
Yakutat Bay
Yakutat
Ocean C.
Dry Bay
Malaspina Glacier
Mt St Elias 18 008
Mt Logan 19 850
Middleton I.
Montague I.
GULF OF ALASKA
CENTRAL
SOUTHEAST
Kodiak I.
Marmot I.
Woody Island
Ouzinkie
PACIFIC OCEAN
YUKON TERRITORY
Mayo
Stewart River
Stewart R
Pelly R
DAWSON RANGE
Carmacks
Nisling R
Aishihik L.
Kluane L.
Burwash Ldg.
Kluane Jct.
Haines Jct.
Whitehorse
Laberge
Teslin R
Carcross
Chilkoot Pass
Chilkat Pass
Skagway
Klukwan
Haines
Port Chilkoot
Lynn Canal
Atlin
Atlin L.
Inklin
BRITISH COLUMBIA
CASSIAR MTS
Dease L.
Telegraph Creek
Juneau
Stikine
COAST MOUNTAINS
Iskut R.
Stewart
Hyder
Unuk R.
Ketchikan
Metlakatla
Nass R.
Wrangell
Petersburg
Kake
Sitka
Baranof I.
Port Alexander
Chichagof I.
Pelican
Hoonah
Angoon
Cross Sd.
Alexander
Christian Sd.
Craig
Klawock
Hydaburg
Prince of Wales I.
Dixon Entrance
Dundas I.
Prince Rupert
Masset
Port Clements
Graham I.
Sandspit
Queen Charlotte
Hecate Str.
Banks I.
QUEEN CHARLOTTE IS.
55°
60°
65°
1
2
8
4
138° 136° 134° 132° 130°
58° 56° 54°
SCALE OF MILES
0 25 50 75 100
Chilkoot Pass
White Pass
KLONDIKE GOLD RUSH N H P
Teresa I.
Nakina
Tuya L
Nahlin
Porter
Dease Lake
BRITISH
Sheslay
Tanzilla R.
Tulsequah
Taku Glacier
Mt Nesselrode 8 105
Devils Paw 8 584
Mt Fairweather 15 300
C Fairweather
Mt Crillon 12 726
Lituya Bay
Icy Pt
Palma B
C Spencer
Cross Sound
GLACIER BAY NAT'L MON
Muir Glacier
Glacier Bay
Gustavus
Excursion Inlet
Pleasant I
Icy Strait
Funter
Hawk Inlet
Elfin Cove
Port Althorp
Hoonah
Yakobi I.
Pelican
Tenakee Springs
Chichagof I
Hoonah Sd
Chatham
Chatham Str
Admiralty I
Stephens Passage
Tracy Arm
Windham
Angoon
Hood Bay
Entrance Island
Mt Ratz 10 290
Fort Houghton
Fanshaw
Frederick Sd
Kates Needle 10 002
Salisbury Sd.
Kruzof I
Baranof
SITKA NAT'L HIST PARK
Sitka
C Edgecumbe
Sitka Sd.
Kupreanof
W. Petersburg
Washington Bay
Petersburg
Mitkof I
Fowler
Iskut
Rakof Is
Whale B.
Kuiu I
Tebenkof B
Wrangell
Sumner Str
Sir Zarembo
Pt Baker
Etolin I
Port Alexander
C Ommaney
Christian Sd.
C Decision
Coronation I.
Pole
Edna Bay
Prince of Wales I
Salt Chuck
Heceta I
Iphigenia B
Klawock (Klawak)
Noyes I
Baker I.
Craig
Waterfall
Hydaburg
Kasaan
Ward Cove
Ketchikan
Saxman
Gravina I
Mountain Point
Metlakatla
Annette
Duke I
Long I
Cordova B.
Dall I.
Bucareli B.
Sukkwan I.
Muzon
C Chacon
Revillagigedo Chan
Dixon Entrance
Dundas I.
Prince Rupert
Langara I
C. Knox
McIntyre Bay
Rose Pt.
Stephens I.
Graham I.
Masset
Porcher I.
Chatham Sd.
Portland Canal
Tongass
Behm Canal
Bell I
Meyers Chuck
Loring
Revillagigedo I
Wacker
Unuk R
Stewart
Hyder
Telegraph Creek
COLUMBIA
ALEXANDER ARCHIPELAGO
COAST MOUNTAINS
CANADA
175° 180° 175°
BERING SEA
Same scale as main map
SOUTH CENTRAL
ALEUTIAN ISLANDS
NEAR ISLANDS
Attu I.
RAT ISLANDS
Kiska I.
Kiska Vol 4,004
Amchitka I.
Semisopochnoi I.
Gareloi I.
Tanaga I.
Kanaga I.
Adak I.
Atka I.
Amlia I.
Amukta Pass
North Cape
ANDREANOF ISLANDS
Amatignak I.
PACIFIC OCEAN
52°
H 150° Longitude J West of 145° Greenwich K 140° L 135° M

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Agattu (isl)	J 3
Akutan (isl)	E 4
Alaska (gulf)	K 3
Alaska (pen)	G 3
Alaska (range)	H 2
Alatna (river)	H 1
Aleutian (isls)	J 4
Aleutian (range)	G 3
Alexander (arch)	L 1
Alsek (river)	L 3
Amchitka (isl)	K 4
Amlia (passage)	L 4
Amukta (isl)	D 4
Andreanof (isls)	L 4
Arctic (plains)	G 1
Atka (isl)	L 4
Attu (isl)	J 3
Baird (mts)	F 1
Baranof (isl)	M 1
Barrow (point)	G 1
Bear (mt)	K 2
Beaufort (sea)	K 1
Becharof (lake)	G 3
Bering (glacier)	K 2
Bering (sea)	D 2
Bering (strait)	E 1
Black (river)	K 1
Blackburn (mt)	K 2
Blying (sound)	C 1
Bona (mt).	K 2
Bristol (bay)	F 3
British (mts)	K 1
Brooks (range)	G 1
Canning (river)	J 1
Chandalar (river)	J 1
Chatham (strait)	M 1
Chichagof (isl)	M 1
Chignik (bay)	G 3
Chilkoot (pass)	M 1
Chirikof (isl)	G 3
Chitina (river)	K 2
Christian (sound)	M 2
Chugach (isls)	H 3
Chugach (mts)	C 1
Chukchi (sea)	E 1
Clarence (strait)	N 2
Clark (lake)	H 2
Clear (cape)	D 1
Coast (mts)	N 1
Columbia (glacier)	C 1
Colville (river)	G 1
Constantine (cape)	G 3
Cook (inlet)	B 1
Cook (mt)	K 2
Copper (river)	J 2
Cordova (bay)	M 2
Coronation (isl)	M 2
Cross (sound)	L 1
Dall (mt)	H 2
Davidson (mts)	K 1
De Long (mts)	F 1
Dease (inlet)	H 1
Decision (cape)	M 2
Demarcation (point)	K 1
Denbigh (cape)	F 2
Devils Paw (mt)	N 1
Dixon Entrance (chan)	M 2
Douglas (mt)	H 3
Dry (bay)	L 3
East (cape)	K 4
Edgecumbe (cape)	L 1
Eielson A F B	J 2
Elmendorf A F B	B 1
Endicott (mts)	H 1
Etolin (isl)	N 2
Fairweather (cape)	L 1
Fairweather (mt)	L 1
Fire (isl)	B 1
Firth (river)	K 1
Foraker (mt)	H 2
Fort Davis	E 2
Fort Greely	J 2
Fort Richardson	C 1
Fort Wainwright	J 1
Four Mountains (isls)	E 4
Fox (isls)	E 4
Frederick (sound)	N 1
Glacier (bay)	M 1
Glacier Bay Nat'l Mon	M 1
Glory of Russia (cape)	D 2
Goode (mt)	C 1
Goodhope (bay)	F 1
Great Sitkin (isl)	L 4
Greenough (mt)	K 1
Guyot (glacier)	K 2
Hagemeister (isl)	F 3
Halkett (cape)	H 1
Hall (isl)	D 2
Harding Icefield	C 2
Harrison (bay)	H 1
Hayes (mt)	J 2
Hazen (bay)	E 2
Heceta (isl)	M 2
Hinchinbrook (isl)	D 1
Hinchinbrook Entrance (chan)	J 3
Holitna (river)	G 2
Hoonah (sound)	M 1
Hope (point)	E 1
Howard (pass)	G 1
Icy (bay)	K 3
Icy (cape)	F 1
Icy (cape)	K 3
Icy (point)	L 1
Icy (strait)	M 1
Iliamna (lake)	G 3
Iliamna (vol)	H 2
Innoko (river)	G 2
Kachemak (bay)	B 2
Kahiltna (river)	B 1
Kaiyuh (mts)	G 2
Kanaga (isl)	L 4
Kantishna (river)	H 2
Kates Needle (mt)	N 1
Katmai (vol)	H 3
Katmai Nat'l Mon	H 3
Kayak (isl)	K 3
Kenai (lake)	C 1
Kenai (mts)	C 2
Kenai (pen)	C 2
Kennedy Entrance (strait)	H 3
Kilbuck (mts)	G 2
King (isl)	E 1
Kiska (isl)	J 4
Klondike Gold Rush Nat'l Hist Park	N 1
Knight (isl)	D 1
Knik Arm (inlet)	B 1
Kobuk (river)	G 1
Kodiak (isl)	H 3
Kokrine (hills)	H 1
Kotzebue (sound)	F 1
Koyukuk (river)	G 1
Krusenstern (cape)	F 1
Kuiu (isl)	M 2
Kuk (river)	G 1
Kupreanof (isl)	N 1
Kupreanof (point)	G 3
Kuskokwim (bay)	F 3
Kuskokwim (mts)	G 2
Kuskokwim (river)	G 2
Kvichak (bay)	G 3
Lisburne (cape)	E 1
Little Diomede (isl)	E 1
Little Sitkin (isl)	K 4
Long (isl)	M 2
Lookout Ridge (mts)	G 1
Louise (lake)	C 1
Lynn (canal)	M 1
Makushin (vol)	E 4
Malaspina (glacier)	K 3
Marcus Baker (mt)	C 1
Marmot (isl)	H 3
Matanuska (river)	C 1
McKinley (mt)	J 2
Meade (river)	G 1
Mendenhall (cape)	E 3
Mentasta (pass)	K 2
Merrill (pass)	H 2
Michelson (mt)	K 1
Middleton (isl)	J 3
Mitkof (isl)	N 2
Mohican (cape)	E 2
Montague (isl)	D 1
Mount McKinley Nat'l Park	H 2
Muir (glacier)	M 1
Mulchatna (river)	G 2
Muzon (cape)	M 2
Naknek (lake)	G 3
Near (isls)	H 3
Nelson (isl)	E 2
Nesselrode (mt)	N 1
Newenham (cape)	F 3
Noatak (river)	F 1
North (cape)	L 4
Northeast (cape)	E 2
Norton (bay)	F 2
Norton (sound)	E 2
Nowitna (river)	H 2
Noyes (isl)	M 2
Nuka (bay)	C 2
Nunivak (isl)	E 3
Nushagak (river)	G 2
Nuyakuk (lake)	F 3
Ocean (cape)	K 3
Ommaney (cape)	M 2
Otter (isl)	D 3
Palma (bay)	L 1
Pastol (bay)	F 2
Pavlof (bay)	F 3
Pavlof (vol)	F 3
Peard (bay)	G 1
Perry (isl)	C 1
Philip Smith (mts)	J 1
Porcupine (river)	K 1
Port Clarence (inlet)	E 1
Port Heiden (inlet)	G 3
Port Houghton (inlet)	N 1
Portland (canal)	N 1
Port Moller (inlet)	F 3
Port Wells (inlet)	C 1
Pribilof (isls)	D 3
Prince of Wales (cape)	E 1
Prince of Wales (isl)	N 2
Prince William (sound)	D 1
Prudhoe (bay)	J 1
Rat (isl)	K 4
Rat (isls)	K 4
Ray (mts)	H 1
Redoubt (mt)	H 2
Revillagigedo (chan)	N 2
Revillagigedo (isl)	N 2
Romanzof (cape)	E 2
Sagavanirktok (river)	J 1
Saint Elias (cape)	K 3
Saint Elias (mt)	K 2
Saint Elias (mts)	L 2
Saint George (isl)	D 3
Saint Lawrence (isl)	D 2
Saint Matthew (isl)	D 2
Saint Paul (isl)	D 3
Salisbury (sound)	M 1
Sanak (isl)	F 4
Sanford (mt)	K 2
Schwatka (mts)	G 1
Seguam (isl)	D 4
Segula (isl)	K 4
Selawik (lake)	F 1
Semichi (isls)	J 3
Semidi (isls)	G 3
Semisopochnoi (isl)	K 4
Seward (pen)	E 1
Seymour (canal)	N 1
Sheenjek (river)	K 1
Shelikof (strait)	H 3
Shemya (isl)	J 3
Shishaldin (vol)	E 4
Shumagin (isls)	G 4
Shuyak (isl)	H 3
Sinus (point)	J 4
Sitka (sound)	M 1
Sitka Nat'l Hist Pk	M 1
Sitkinak (isl)	H 3
Sitkinak (strait)	H 3
Skilak (lake)	C 1
Skwentna (river)	A 1
Smith (bay)	H 1
Southeast (cape)	E 2
Spencer (cape)	L 1
Spencer (point)	E 1
Spurr (mt)	B 1
Steller (mt)	K 2
Stephens (passage)	N 1
Stepovak (bay)	G 3
Stevenson Entrance (strait)	H 3
Stikine (river)	N 2
Stikine (strait)	N 2
Stony (river)	G 2
Stuart (isl)	F 2
Suemez (isl)	M 2
Sumner (strait)	M 2
Susitna (river)	B 1
Taku (glacier)	N 1
Taku (river)	N 1
Talkeetna (mts)	J 2
Tanaga (isl)	K 4
Tanaga (vol)	K 4
Tanana (river)	J 2
Tangent (point)	H 1
Taylor (mts)	G 2
Tazlina (lake)	D 1
Tazlina (river)	D 1
Tabenkof (bay)	M 2
Ten Thousand Smokes, Valley of	G 3
Teshekpuk (lake)	H 1
Tigalda (isl)	F 4
Tikchik (lakes)	G 2
Tingmerkpuk (mt)	F 1
Togiak (bay)	F 3
Tracy Arm (inlet)	N 1
Trading (bay)	B 1
Tugidak (isl)	G 3
Turnagain Arm (inlet)	B 1
Tustumena (lake)	C 1
Two Arm (bay)	C 2
Ugashik (lakes)	G 3
Umnak (isl)	E 4
Umnak (passage)	E 4
Unalaska (isl)	E 4
Unga (isl)	F 3
Unimak (bight)	F 4
Unimak (isl)	E 4
Unimak (passage)	F 4
Unuk (river)	N 2
Utukok (river)	F 1
Vancouver (mt)	L 2
Vega (point)	J 4
Veniaminof Crater (vol)	F 3
Vsevidof (mt)	E 4
Walrus (isl)	E 3
Walrus (isls)	F 3
Waring (mts)	G 1
West Point (mt)	K 2
Whale (bay)	M 1
White (mts)	J 1
White (pass)	N 1
White (river)	K 2
Witherspoon (mt)	D 1
Wrangell (cape)	H 3
Wrangell (isl)	N 2
Wrangell (mts)	K 2
Yakobi (isl)	M 1
Yakutat (bay)	K 3
Yentna (river)	A 1
Yukon (river)	F 2
Zarembo (isl)	N 2

An active volcano in the Katmai National Monument, in southern Alaska. Shelly Grossman-Woodfin Camp & Associates

Bristol and Kuskokwim bays, and Norton and Kotzebue sounds, between which lies the Seward Peninsula (q.v.). Cape Prince of Wales, at the tip of the Seward Peninsula, is the westernmost point in North America.

Geographically, Alaska is usually divided into six regions, as follows. (1) Northern Alaska, lying within the Arctic Region, is dominated by the Brooks Range, a part of the Rocky Mts. system. North of the mountains the terrain declines into the arctic slope, a region of frozen tundra (q.v.). (2) Western Alaska, in the area of the deep sounds and bays, is principally tundra, broken by many hills. The St. Lawrence, Nunivak, and Pribilof islands lie off the W. coast. (3) South-central Alaska is roughly bounded by the Alaska Range in the N., Cook Inlet in the W., and the Panhandle in the E. In the Alaska Range are Mt. McKinley (20,320 ft.), the highest peak in North America (*see* MCKINLEY, MOUNT), and Mt. Foraker (17,395 ft.). In the E. part of the region are the Chugach and Wrangell mountains. The latter are marked by three high peaks, Mt. Bona (16,421 ft.), Mt. Sanford (16,208 ft.), and Mt. Blackburn (16,523 ft.), and by Mt. Wrangell (14,006 ft.), the highest active volcano in Alaska. Separating the south-central region from the Panhandle is part of the Saint Elias Range, dominated by Mt. St. Elias (18,008 ft.); to the W. the Kenai Mts. run the length of the Kenai Peninsula. (4) Southwestern Alaska comprises the Alaska Peninsula, with the Aleutian Range running down its S. side, the Aleutian Islands, and Kodiak and Afognak islands in the Gulf of Alaska. In the Aleutian Range, near the N. end of the Alaska Peninsula, is the volcanic Mt. Katmai, which has one of the largest craters in the world. Adjoining it is the Valley of Ten Thousand Smokes, about 17 mi. long and 4 mi wide, so named because of the innumerable steam vents with which it is dotted. (5) Southeastern Alaska encompasses the Panhandle, including the islands of the Alexander Archipelago. Its border with Canada is marked by the Coast Range, with elevations up to 15,000 ft. (6) Interior Alaska, lying between the Brooks Range and the Alaska Range, forms the drainage basin of the Yukon River (q v.), the largest river of the State. A deeply dissected and eroded plateau, it consists mainly of rolling uplands.

Glaciers, which are numerous on the seaward slopes of the coastal ranges, are a prominent feature of Alaskan topography. Notable among them are Malaspina Glacier, about 1500 sq.mi. in area, and Muir Glacier, about 350 sq.mi., both in the St. Elias Range. *See* GLACIER BAY NATIONAL MONUMENT.

Rivers and Lakes. The Yukon R and its tributaries, including the Porcupine, Tanana, and Koyukuk rivers, form the major watercourse of Alaska, flowing across the State from E. to W. and emptying into the Bering Sea. The Kuskokwim R. empties into Kuskokwim Bay; the Colville and Noatak rivers drain into the Arctic Ocean; and the Susitna, Matanuska, and Copper rivers flow into arms of the Pacific Ocean. The largest lake is Iliamna, N. of the Alaska Peninsula. To the N. of Iliamna is Clark Lake, and to the S. are Nak-

Climate	Anchorage	Fairbanks	Juneau	Nome
Normal temperatures (in ° F.)				
January maximum	20.0	−2.2	29.1	13.5
January minimum	3.5	−21.6	17.8	−1.6
July maximum	65.6	71.8	63.6	55.8
July minimum	50.1	49.6	47.7	44.4
Annual	35.0	25.7	40.3	25.6
Normal precipitation (in inches)				
Wettest month	2.37	2.19	7.85	3.57
Driest month	.56	.33	2.93	.70
Annual	14.74	11.22	54.67	16.44
Latest frost	May 18	May 24	April 27	June 12
Earliest frost	Sept. 13	Aug 29	Oct 19	Aug 24
Mean number of days between latest and earliest frosts	118	97	176	73

nek, Becharof, and Ugashik lakes On the Kenai Peninsula are Tustumena, Skilak, and Kenai lakes, and in N.W. Alaska is Selawik Lake.

Climate. Alaska may be divided into four major climatic zones. (1) the region of maritime influences, (2) the region of transition from maritime to continental influences; (3) the region of continental climate; and (4) the region of arctic influence.

The region of maritime influences comprises the islands and coastline of the S.E., the coast of the Gulf of Alaska, the offshore islands, and the Aleutian chain Characteristic climatic features are small temperature variations, high humidities, frequent fog, and abundant precipitation Summers are cool and winters mild, and the occasional extremes of temperature are localized and brief. The region has frequent strong but very localized winds, readings of 70 to 90 m.p.h occurring occasionally during the winter. Precipitation is abundant, occurring as rain in summer and frequently even in winter; however, a permanent snow cover accumulates during the winter, to varying depths depending on occasional periods of above-freezing temperatures.

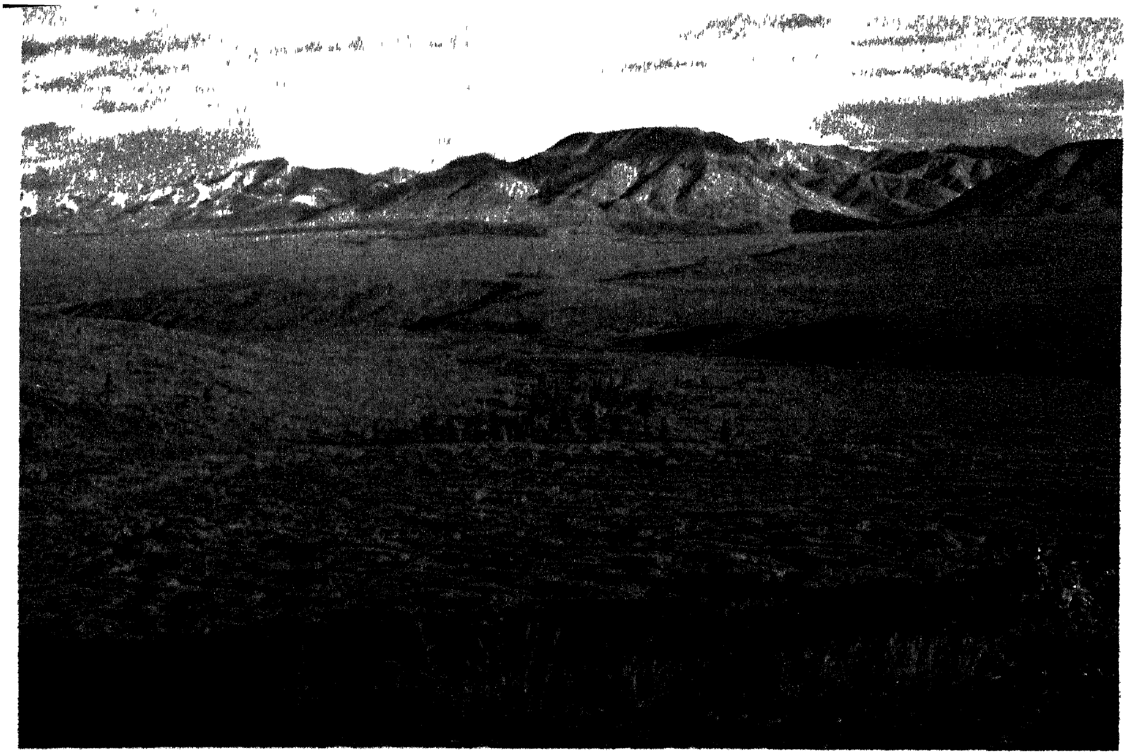
In the transition region, comprising a belt extending across and including the Copper R., Cook Inlet, Bristol Bay, and the west-central part of the State, temperature variations become more pronounced, and humidity and precipitation decline Temperatures range from 40° F. to 70° F. in summer and from −40° F. to 10° F. in winter Precipitation varies depending on the presence or absence of sheltering mountains, but the entire region receives a generally permanent snow cover during the winter months. The permafrost (q.v) area of perennially frozen ground extends southward well into the transition region.

The region of continental influence is affected by two climatic factors, the distance from the ocean and the surrounding topographic barriers that prevent the inland movement of maritime air The record high and low temperatures for the State were both recorded in this region: 100° F. (at Fort Yukon), and −76° F. (at Tanana). The length of the days from early June to late July contributes to the warm temperatures; however, ground temperatures remain low except for a shallow surface layer, and permafrost underlies the entire interior basin Precipitation is relatively light, with rain showers in summer.

The region of arctic influence, which includes the N. coast and the Kotzebue Sound area, has narrower temperature variations than the interior region and very light precipitation. The temperature in summer virtually never rises above 80° F., and extreme lows range between −45° F. and −60° F Strong winter winds result in prolonged periods of blowing and drifting snow and make accurate precipitation measurement difficult Maximum snowfall for the region is about 65 in Sea ice in this region has an important influence on local climate and is also, of course, a hazard to transportation

Plants and Animals. The vegetation of Alaska is rich and diversified, ranging from immense growths of coniferous trees to vast tracts of mosses and sedges in the tundra In the Panhandle, a region of extensive virgin forests, the predominant species are hemlock and Sitka spruce. Spruce also predominates in the interior. Other varieties of trees common to Alaska are balsam poplar, birch, cottonwood, aspen, alder, willow, and cedar

The Alaskan fauna, an important source of wealth, include a remarkable variety and abundance of wildlife Among the smaller furbearing mammals are mink, beaver, muskrat, ermine, marten, river otter, lynx, wolf, wolverine, and two species of fox The important large mammals include the wild white sheep and mountain goats, deer, moose, caribou, and several kinds of bears, notably the enormous Kodiak bear (the largest carnivorous terrestrial animal extant), which is indigenous to Kodiak Island. The Alaskan brown bear, a variety closely allied to the Kodiak bear, inhabits the adjacent mainland, and the polar bear is indigenous to the extreme N. section of the State. Domesticated



The tundra, an autumn view Behind loom mountains of the Alaska Range Jen & Des Bartlett-Bruce Coleman, Inc

reindeer were imported to Alaska at the turn of the century by the U S. government. Herds are the exclusive property of the native residents. Of marine mammals, the most important is the fur seal of the Pribilof Islands. Early in the 20th century the species was threatened with extinction by commercial hunters. Stringent protective measures were adopted by the U.S. government in 1910, and the open-sea killing of seals was prohibited in the following year by an agreement among the U.S., Great Britain (for Canada), Russia, and Japan (*see* BERING SEA CONTROVERSY; SEAL). The sea otter is another valuable species that has responded favorably to protection. Other varieties of marine animals found in Alaskan waters are whales, porpoises, sea lions, and walruses. Numerous species of fish, including cod and halibut, occur in coastal waters, and the streams abound with salmon and trout. Three species of ptarmigan are widespread in Alaska, and waterfowl and many other species of bird are abundant in summer.

Parks, Forests, and Other Places of Interest. Mount McKinley National Park, in south-central Alaska, between Fairbanks and Anchorage, contains Mt. McKinley, the highest mountain (20,320 ft.) in North America. Glacier Bay National Monument, about 100 miles N. of Juneau, has great tidewater glaciers and many peaks over 12,000 ft., including Mt. Fairweather (15,300 ft.). Katmai National Monument (q.v.), at the base of the Alaska Peninsula, includes the Valley of Ten Thousand Smokes, scene of a violent volcanic eruption in 1912 Sitka National Historical Park (*see* SITKA) is the site of an Indian stockade in which the Kik-Siti tribe made their last stand against Russian settlers Alaska has two national forests, comprising almost 21,000,000 acres. Chugach National Forest, on Prince William Sound and the E. part of the Kenai Peninsula, contains the Kenai Mts., three glaciers, Aleut villages, and historic Russian churches. Tongass National Forest, in the Panhandle of the State, is divided into N. and S. regions; its points of interest include the rugged Alaska coast, fjords, snow-capped mountains, glaciers, and hundreds of islands.

Sports. Alaska offers a wide variety of fishing. The many rivers and lakes contain trout, salmon, grayling, whitefish, and pike, and the coastal waters provide salmon and halibut. Big-game animals hunted in the State include black, brown, grizzly, and polar bears, mountain sheep, mountain goats, moose, and caribou. Small game is also plentiful. Skiing begins in October and lasts until May; resorts include Alyeska and Arctic Valley, near Anchorage, and Cleary Summit, near Fairbanks. The St. Elias, Wrangell, and Alaska ranges all have majestic mountains of interest to climbers.

THE PEOPLE

According to the results of the 1970 decennial census, the population of Alaska was 302,173, an increase of 33.6 percent over the 1960 population. The urban segment comprised 145,512 persons (48.4 percent of the total), compared with 37.9 percent in 1960. The rural segment comprised 154,870 (51.6 percent of the total), compared with 62.1 percent in 1960. Ethnically, the 1970 population was distributed as follows. white persons, 236,767, nonwhites, 63,615, including 16,276 Indians, 8911 Negroes, and a few Filipinos, Japanese, Chinese, and others. In 1960 there were more than 28,000 Eskimos and Aleuts The percentage of American-born residents in 1970 was 97.4; of foreign-born, 2.6. The major countries of origin of the foreign-born were Canada, Germany, and Great Britain. The 1970 population density averaged 0.5 per sq.mi., compared with 0.4 in 1960.

The chief cities are Juneau, the capital and third-largest city, a seaport and airline hub and a commercial fishing center; Anchorage, the largest city; a center of air and rail transportation and trade, and Fairbanks, the second-largest city, a distribution center for agricultural and mining products, and the site of the University of Alaska

An Eskimo couple relax outside their igloo (house). The dome-shaped, snow-block igloo has never been built by the Alaskan Eskimo Alaska Tour & Marketing Serv., Inc

The largest Indian settlements in terms of population are at Hoonah, Petersburg, and Wrangell, in the Juneau area, and at Sitka, inhabited by the Tlingit tribe. Other Tlingit settlements are at Angoon, Haines, Kake, Ketchikan, Klawock, Klukwan, and Saxman Annette Island is the site of a Tsimshian settlement, and Haida Indians live in settlements at Craig, Hydaburg, and Kasaan A mixed settlement is situated at Mt. Edgecumbe

Settlements in the Anchorage area number 10 for Eskimos, 6 for Aleuts, and 5 for Athapascans, in the Bethel area, 20 for Eskimos and 4 for Athapascans, in the Fairbanks area, 3 for Eskimos, 10 for Athapascans, and 2 for both tribes; in the Nome area, 27 for Eskimos

Education. The public school system of Alaska was established in 1884 Alaska has two public-school systems, one supported by State and local governments and another, consisting of 75 schools for Aleut Eskimo, and Indian children, supported entirely by Federal funds. Education is free and compulsory for all children between the ages of seven and sixteen

ELEMENTARY AND SECONDARY SCHOOLS. In the early 1970's public elementary schools numbered about 255, and public secondary schools, about 60 Enrollment totaled about 62,000 in elementary and about 23,000 in secondary schools. Teachers in the public school system numbered about 2600 in elementary and about 1500 in secondary schools In the early 1970's private schools included about 20 elementary schools with some 1000 students, and about 10 secondary schools with some 1000 students Private-school teachers totaled 170 in the late 1960's.

UNIVERSITIES AND COLLEGES. Alaska had three institutions of higher learning in the early 1970's, two of which were private University and college enrollment totaled about 10,000 The University of Alaska (q.v.) is supported by State funds; Alaska Methodist University, in Anchorage, and Sheldon Jackson Junior College, in Sitka, are privately supported

Libraries and Museums. The Alaska State Library, in the State capitol, includes the Alaska Historical Library, the most comprehensive collection of Alaskana in existence. The Alaska State Museum is also in Juneau. The Sheldon Jackson Junior College Museum, in Sitka, features Russian historical displays and Indian artifacts and relics. The Trail of '98 Museum, in Skagway, houses relics of the Klondike (q.v.) gold rush and exhibits of Alaskan history.

THE ECONOMY

Alaska has a diversified economy. The per capita personal income in 1976 was $10,178, the high-

Juneau, seen from the harbor. Situated in the southeast, in the Alaskan Panhandle, the capital enjoys a temperate climate Sullivan & Rogers-Bruce Coleman, Inc

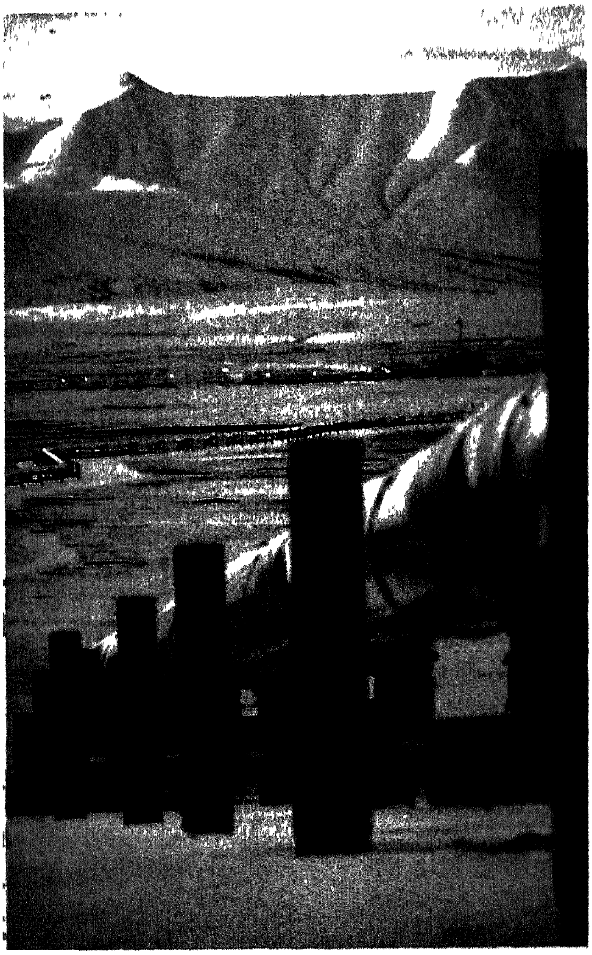
est in the U.S., compared with $6441 for the country as a whole. Agricultural employment is negligible. Nonagricultural workers are employed, in descending order of numbers, in government, construction, service industries, wholesale and retail trade, transportation and public utilities, manufacturing, and finance, real estate, and insurance. Tourism is a major contributor to the economy. In recent years, construction and operation of the first oil pipeline have increased employment and also the State's population—the latter by four times the rate in the U.S. as a whole.

Manufacturing. According to a recent survey of manufactures, production workers in Alaska in the mid-1970's totaled 6300. The largest groups were employed in food processing, in lumber and wood products, and in stone, clay, and glass products. The two largest manufacturing centers were Anchorage, with about one fifth of the workers, and Fairbanks. The value added by manufacture (see VALUE) totaled $101,300,000 for lumber and wood products, $91,500,000 for food processing, and $17,600,000, for printing and publishing. The value added by all manufacture in Alaska in the mid-1970's was about $449,200,000 annually.

Agriculture. Agriculture is relatively unimportant in Alaska, which imports about 90 percent of its food. The most important commodities produced in the State are dairy products, hay, and potatoes. More than half of Alaska's farm products are grown in the Matanuska Valley north of Anchorage. There were about 300 farms in Alaska in the mid-1970's, covering some 1,710,000 acres. The average size of a farm was 5700 acres. Total cash receipts from agriculture were about $9,000,000 annually, of which $5,000,000 came from livestock and $4,000,000 from crops.

Fishing. Alaska, one of the Pacific Coast States, has excellent fisheries that provide crab, flounder, halibut, herring, mackerel, salmon, shrimp, and tuna Although ranking fourth in total catch, Alaska is the leading State in value of commercial fishing. In the mid-1970's, the catch amounted to about 34,132,000 lb. annually, with a value of $145,220,000.

Mining. Petroleum is Alaska's most important mineral product Production of oil from the Prudhoe Bay oil field began in 1977, and the first oil was delivered through the Trans-Alaska pipeline that summer. Estimated recoverable reserves of petroleum at Prudhoe Bay are about 10 billion bbl; in addition, the field contains an estimated 24.5 billion cu.ft. of natural gas. The U S. and Canada agreed in 1977 to construct a natural gas pipeline from Prudhoe Bay across Canada to Alberta, where it would connect with existing pipelines to the U.S. Structural materials such as stone, cement, and gravel are other important



An aboveground length of the Trans-Alaska pipeline The pipeline wends its way to the southern port of Valdez, from which the oil it carries is shipped to the "South 48" (the conterminous States) Alyeska Pipeline

minerals. The value of mineral production in Alaska in the mid-1970's, before the pipeline opened, was about $481,000,000 annually.

Energy. Electric energy produced in Alaska amounted to some 2.8 billion kw hour annually in the mid-1970's Both production and capacity were rising steadily. Only 3.2 percent of production and 4.7 percent of capacity were privately owned.

Forestry. The forest land of Alaska, mostly under Federal control, consists primarily of softwoods. The commercial land, about 5 percent of the forest area, comprises some 5,640,000 acres. It produces a net annual cut of sawtimber of some 1,000,000,000 bd.ft.

Tourism. Alaska is visited each year by some 150,000 tourists, who spend some $30,000,000. The cities most visited are Anchorage, Fairbanks, and Juneau.

Transportation. The first railroad in Alaska was the White Pass & Yukon Railway, opened July 21, 1898 There are about 670 mi of track in the State. There are about 4600 mi. of rural and municipal roads, and some 3300 mi. of Federally assisted primary and secondary roads Small airplanes are by far the most important means of transport In the mid-1970's Alaska was served by 11 international and 10 local and interstate airlines; there were about 546 public and 223 private airports Anchorage and Ketchikan are the leading ports

Communications. The first newspaper in Alaska was the *Esquimaux* (1866), published for a cable-survey expedition of the Western Union Telegraph Co., the first general paper was the Sitka *Times*, founded in 1868 In the mid 1970's Alaska had 7 daily newspapers and 1 Sunday paper. The leading newspapers were the Anchorage *News* and *Times* and the Fairbanks *News-Miner*. There are 38 radio stations and 10 television stations; among the earliest radio stations was KFCD in Anchorage, which began broadcasting in 1924

GOVERNMENT

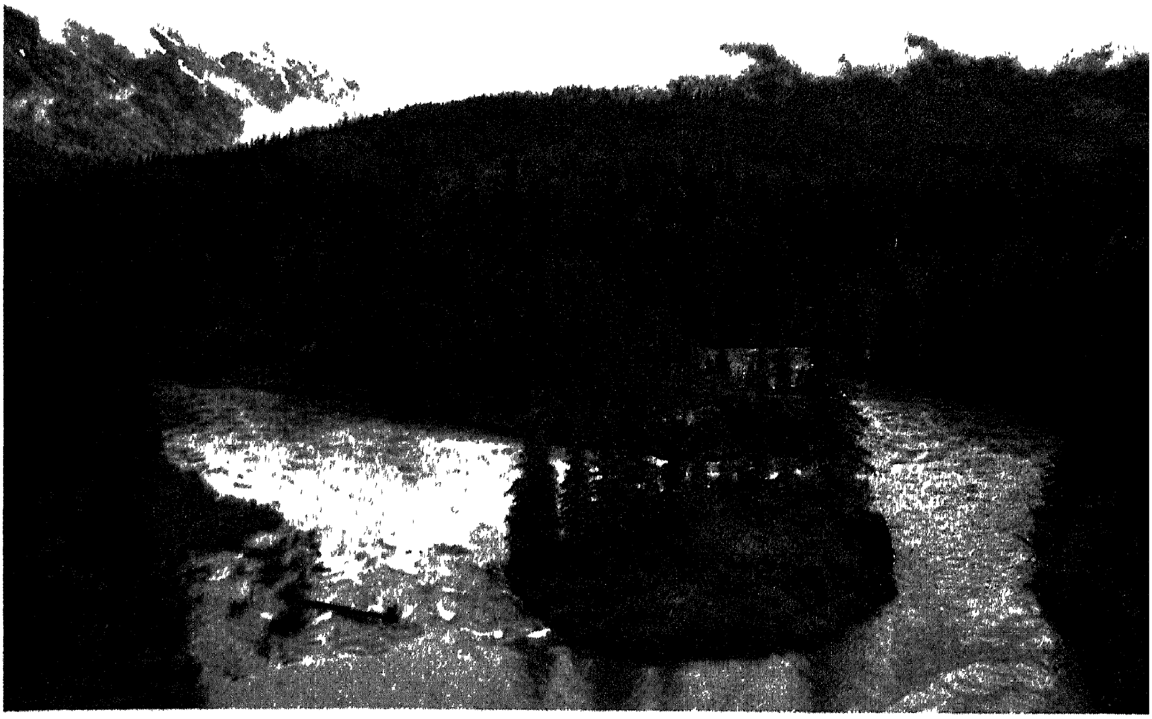
Alaska is governed under the constitution of 1956. Executive authority is vested in a governor and lieutenant governor, elected for four year terms; an attorney general, appointed by the governor; and other elected and appointed officials. Legislative authority is exercised by the Senate, with twenty members elected for four-year terms, and the House of Representatives, with forty members elected for two-year terms. Legislative sessions are held annually. The State judicial system consists of a five-member supreme court, superior courts, and lesser courts. The State is divided into boroughs for purposes of local government

Alaska is represented in the U.S. Congress by two Senators and one Representative.

Voting Qualifications. Suffrage is extended generally to U.S. citizens eighteen years of age who have resided in the State for seventy-five days and in the election district for thirty days.

HISTORY

Evidence exists, in the form of old maps, that the coast of present-day Alaska was known to explorers as early as 1579. Systematic exploration of the region did not begin, however, until 1741. In that year an expedition under the command of the Russian-employed Danish navigator Vitus Bering (q.v.) reached the mainland, in the vicinity of modern Sitka, and discovered many of the off-lying islands In 1783 the Russians established a settlement on Kodiak Island. A large section of the coast had been surveyed, meanwhile, by the British navigator James Cook (q.v.).



Alaska's richness in timber is suggested by this stand of evergreens along the Moose River, on the Kenai Peninsula in the south
Dr E R. Degginger-Bruce Coleman, Inc

Other British explorers, notably George Vancouver and Alexander Mackenzie (qq.v.), made important discoveries in the region. In 1799 a Russian fur-trading organization, the Russian-American Company, obtained by royal charter a monopoly, extending as far south as 55° N. lat., over the natural resources of the region then called Russian America. The company was managed by the Russian fur trader Aleksandr Andreyevich Baranov (1747-1819). Under his leadership the company founded a number of settlements, including New Archangel (1799), later known as Sitka, and maintained its primary interest, the fur trade. In 1825, following a jurisdictional dispute, the Russian and British governments concluded an agreement on the boundaries of Russian America. The royal charter of the Russian-American Company was allowed to lapse in December, 1861, and during the next few years Russian America was administered by an imperial governor.

The U.S. Acquires Alaska. After the close of the American Civil War the United States government, under pressure from influential west-coast fishing interests, began to negotiate with the Russian government for the purchase of Russian America. The negotiations were brought to a successful conclusion on March 30, 1867, by William Henry Seward (q.v.), U.S. Secretary of State. Under the terms of a treaty signed on that date by the two governments, Russian America was ceded to the U.S. in exchange for $7,200,000. Many American politicians and journalists critized the purchase, dubbing it "Seward's Folly", "Icebergia", and "Wallrussia" Seward named the territory Alaska, a corruption of Aleut *alakshak* or *alayeksa* ("a great country") Ceremonies marking the transfer of Alaska to the U.S. were held at Sitka on Oct. 18, 1867

The Congress of the United States failed to provide Alaska with a civil government until 1884. During the intervening period the possession was governed successively by the United States Army, a customs collector, and the United States Navy. Although American settlers in Alaska had petitioned Congress to establish the possession as a Territory, the enactment of 1884 made it a District. The legislation contained many shortcomings, such as the failure to provide for a strong executive, representative government, and powers of taxation Attempts to secure modifications from Congress proved fruitless until after the discovery (August, 1896) of gold in the Klondike of Canada and, subsequently, in the Yukon R. valley in Alaska Beginning in 1898, Congress adopted a series of bills designed to remedy various evils in the District Popular demands for a Territorial form of government were ignored, however, until 1912, when the Organic Act approved the establishment of Alaska as a Territory. Meanwhile, attempts by certain American corporate interests to acquire control of natural resources in Alaska had precipitated violent controversies in District and national political circles. Evidence of gov-

Community house of the Haida Indians, near Ketchikan The totem poles were designed specifically for the building, now little used S J Krasemann-Peter Arnold, Inc

ernmental collusion and fraud was uncovered in subsequent investigations, with the result that far-reaching Alaskan conservation measures to protect the Territory's resources were ultimately promulgated (*see* PINCHOT, GIFFORD).

Economic and social conditions improved steadily in Alaska during its first quarter century as a Territory. Measures were taken to better the lot of the aborigines. The fishing-canning industry flourished. In 1923 the Fairbanks-Seward railway was completed. Although copper production, formerly a major source of wealth, dropped alarmingly after 1926, gold production increased, especially after 1933. The Federal government initiated an extensive program of defense construction in the Territory following the outbreak of World War II. This program was enormously expanded after the Japanese attack on Pearl Harbor in 1941. Huge military, naval, and air bases were established in many parts of the Territory, and work on the Alaska Highway (q.v.) was accelerated. In June, 1942, Japanese forces occupied Kiska and Attu, the most westerly of the Aleutian Islands. The invaders were expelled by an American-Canadian task force in August, 1943.

The strategic importance of Alaska in national defense planning became increasingly apparent in the postwar period Various military establishments in the Territory were kept in operation after the close of hostilities, and in subsequent years several new air bases were built. The United States House of Representatives had meanwhile (1946) approved legislation making Alaska the forty-ninth State of the Union. This measure, which had been previously endorsed by the Alaskan electorate, failed to receive the approval of the United States Senate. In 1950 the Senate failed to act on an identical bill to grant Statehood

In 1952 a U.S. firm began construction of a large pulp mill in Ketchikan The first Alaskan plywood factory went into production in 1953, and in that year and in 1954 occurred a tremendous upsurge of interest in the petroleum resources of the Territory Explorational work was carried out by private firms, and nearly 1700 oil and gas leases on public lands were issued.

Statehood. On April 1, 1954, the U.S. Senate approved a bill conferring Statehood on Alaska, but the House of Representatives failed to take action on the measure The bill was reintroduced in the Congress early in 1955 and was rejected by the House on May 10. On Nov. 8, 1955, a constitutional convention met to draft a constitution for the proposed State of Alaska. The convention also adopted an ordinance providing for the immediate election of two Senators and one Representative to represent Alaska in the United States Congress. The draft constitution was approved by Alaskan voters on April 24, 1956, but no action was taken by Congress to admit Alaska as a State.

In early 1958 President Dwight D. Eisenhower (q.v.) urged passage of an Alaskan-Statehood bill. Such legislation was passed in the House on May 15 by a vote of 318 to 51, approved by the Senate on June 30 by a vote of 64 to 20, and signed by President Eisenhower on July 8, 1958. In a special election held on Aug. 26, 1958, Alaskans voted their approval of Statehood by a margin of five to one. In another election, on Nov. 25, 1958, Democrats won the major Alaskan political offices, including two U.S. Senate seats, one seat in the House, and the governorship. On Jan. 3, 1959, President Eisenhower signed a proclamation granting Alaska Statehood, making it the first new State since 1912.

At first, Statehood proved economically burdensome, as Alaska had to assume public service expenditures formerly borne by the Federal government. Further hardship arose when the most powerful earthquake ever recorded in North America struck Alaska in March, 1964, causing about 120 deaths and $1 billion in damage.

The 1968 discovery of vast petroleum and natural gas deposits on northern Alaska's North Slope, a region between the Brooks Range and the Arctic Ocean, at last promised economic relief. During 1975-77, an 800-mi. oil pipeline was built from Prudhoe Bay, an arm of the Arctic Ocean, to Valdez, a port on the Pacific Ocean. Large-scale oil production began in late 1977, with the prospect of annual oil revenues reaching hundreds of millions of dollars.

But since Alaska contains America's only important Arctic wilderness, efforts are under way to reconcile the State's new economic, social, and political realities with the need to preserve environmental integrity through the judicious application of land-use management.

ALASKA HIGHWAY, section of the Pan American Highway (q.v.) that links Dawson Creek, British Columbia, Canada, with Fairbanks, Alaska, by way of Whitehorse, Yukon Territory. In the S. the highway joins a road that serves Edmonton, Alberta, Canada, and in the N. it is joined by highways that serve Valdez and Anchorage, Alaska. The Alaska Highway is 1527 mi. long, and extends in a generally N.W. direction along the E. edge of the Rocky Mts. across extremely rough terrain. Construction was begun shortly after the United States entered World War II to provide an overland supply route to the U.S. armed forces in Alaska. The highway was completed between March and October, 1942, at a cost of $139,000,000. It was maintained by the U.S. as a military road until 1946, when the Canadian section (1221 mi.) was turned over to the Canadian government for maintenance. In 1948 the highway was opened to civilian travel. Known as the Alcan Highway until 1945, the Alaska Highway has an all-weather surface (gravel in Canada; paved in Alaska) and is open to traffic the year around. Travel conditions vary according to weather and season, however. Snow and sub-zero temperatures often block the road in winter, and spring floods frequently cause damage to the many bridges along the route. Gasoline stations, sleeping accommodations, roadside facilities, and telephone and telegraph service are available at regular intervals along the entire route.

ALASKA RANGE, one of the principal mountain ranges in the State of Alaska. It extends in a generally N.E. direction from the base of the Alaska Peninsula to the frontier of Yukon Territory, Canada. The range averages about 50 mi. in width; it forms the parting between the Pacific drainage basin of Alaska, on the S., and the Bering Sea drainage basin, on the N. and W.; the highest peak is Mt. McKinley (20,320 ft.)

ALASKA, UNIVERSITY OF, coeducational land-grant institution (*see* LAND-GRANT COLLEGES) opened near Fairbanks, Alaska, in 1922. It now is a Statewide system, including campuses at Anchorage and Juneau and eight community colleges, at Auke Bay, Bethel, Kenai, Ketchikan, Kodiak Island, Palmer, and Sitka. Degrees of associate, bachelor, master, and doctor are granted within the system. The Fairbanks campus has colleges of arts and letters; behavioral sciences and education; biological sciences; business, economics, and government; earth sciences and mineral industry; and mathematics, physical sciences, and engineering. In 1973 the Fairbanks library housed some 350,000 volumes; the endowment in 1972 was about $2,217,000. In 1973 student enrollment in the Statewide system was 12,500, and the faculty numbered about 370.

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ALA-TAU, *or* ALATAU, name of several mountain ranges of the Tien Shan system, located near Issyk-Kul' lake in the Kirghiz S.S.R. and the Kazakh S.S.R., and forming part of the border with the Sinkiang Uighur Autonomous Region of China. The peaks of the Ala-Tau ranges are from 10,000 to 18,000 ft. above sea level.

ALAY MOUNTAINS, *or* ALAI MOUNTAINS, range of lofty mountains of Central Asia, in the S.W. portion of the Kirghiz S.S.R. and forming a S.W. extension of the Tien Shan Mts. The average height of the Alay Mts. is about 16,000 ft.

ALBA, Fernando Álvarez de Toledo, Duke of. *See* ALVA, FERNANDO ÁLVAREZ DE TOLEDO, DUKE OF.

ALBACETE, city in Spain, and capital of Albacete Province, about 137 miles S.E. of Madrid. It is on the main railroad line from Madrid to S.E. coastal points. The city is a market center for agricultural products; the principal industry is the manufacture of matches. Pop. (1970) 93,233.

ALBACORE. *See* TUNA.

ALBA IULIA (Hung. Gyulafehérvár, Ger. *Karlsburg*), city of Rumania, in Hunedoara Region, on the Mureş R., about 110 miles E. of Arad. The city consists of an upper town, or citadel, constructed by Charles VI (q.v.), Holy Roman Emperor, between 1716 and 1735; and a lower town, which contains a noted cathedral and the Batthyaneum, a museum founded in 1794. Constructed in the 11th century, the cathedral was rebuilt in the 15th century in the Gothic style. A library, an observatory, and a museum are in the Batthyaneum. Alba Iulia occupies the site of the Roman colony Apulum, and many Roman relics are in the museum. The tomb of the Hungarian patriot János Hunyadi (q.v.) is in Alba Iulia. Pop. (1971) 28,646.

ALBA LONGA, one of the oldest cities of Italy, in ancient Latium. According to Roman legend, it was founded by Ascanius, son of the Trojan hero Aeneas (q.v.). The city was long the head of the ancient confederacy known as the Latin League, but was destroyed by the Romans under Tullus Hostilius (673–641 B.C.), the legendary third king of Rome, and was never rebuilt. Alba Longa was located on a rocky ridge above Lake Albano. Scholars disagree as to whether it was located on the E. or W. shore of the lake; the latter site seems more likely, for an ancient necropolis containing tombs built about 1100 B.C. was found there.

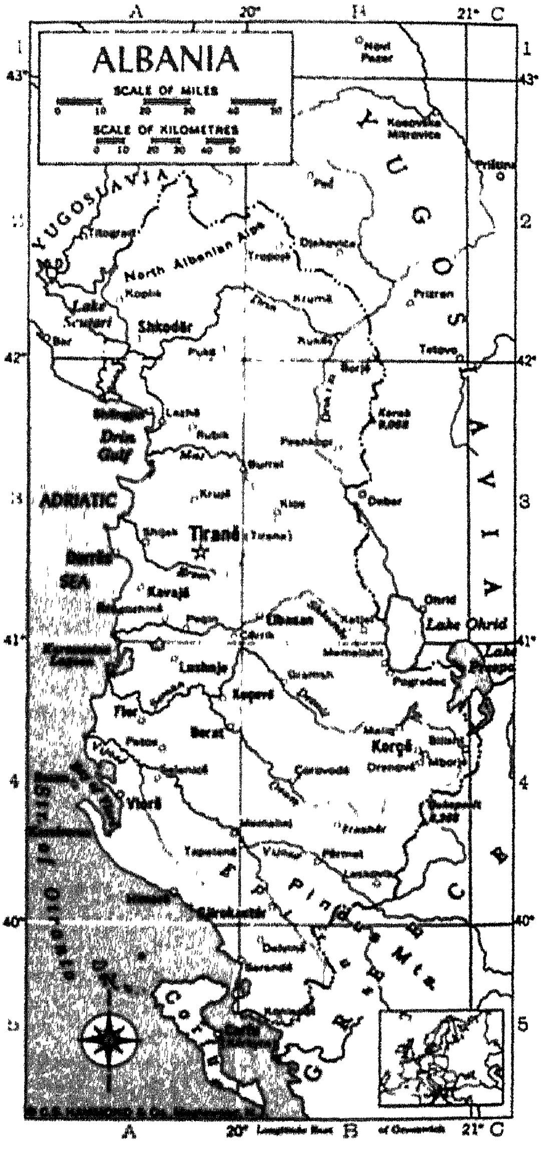
ALBAN, Saint (fl. 3rd cent.), first English martyr. He was probably born at the town of Verulamium (now Saint Albans, Great Britain) in the Roman province of Britain, and served in the Roman army. He was put to death for being a Christian some time during the late 3rd or early 4th century. The feast day of Saint Alban is June 22 in the Roman Catholic Church, and June 17 in the Church of England.

ALBANIA (Albanian *Shqipni*, "Eagle's Country"), nation of Europe in the W. part of the Balkan Peninsula, bounded on the N.W., N., and E. by Yugoslavia; on the S.E. and S. by Greece; and on the W. by the Adriatic Sea. Albania lies between lat. 39°38′ N. and lat. 42°41′ N. and long. 19°16′ E. and long. 21°03′ E. The smallest of the Balkan countries, Albania has a maximum length from N. to S. of about 215 mi. and a maximum width of about 90 mi. The total area of the country is 11,096 sq mi.

THE LAND

Albania is mostly mountainous, but the terrain is broken by a wide belt of coastal lowlands backed by rugged uplands. One of the principal mountain ranges is the North Albanian Alps, a continuation of the Dinaric Alps of Yugoslavia. Many mountains in Albania rise abruptly from the lowlands to above 8000 ft. The highest elevation in the country is Korab Mt. (9068 ft.). In central and S.E. Albania the mountains are interspersed with high plateaus and basins. The Albanian lowlands consist of plains interrupted by hilly ridges.

The rivers of Albania usually rise at a high alti-



tude in the interior and descend swiftly to the coastal plain through steep gorges. The longest river of Albania is the Drin Other important rivers are the Shkumbî, Semeni, Arzen, Mati, and the Vijosë. The Bojana, the only navigable river of Albania, marks part of the border with Yugoslavia. Three large lakes lie on the borders of the country: Lake Scutari in the N.W., and Lake Ohrid and Lake Prespa in the S.E.

Climate. Albania lies in two climatic zones. Along the coast the climate is typically Mediterranean, with mild, humid winters and dry summers. The uplands have a more northerly climate, with marked seasonal extremes in temperature. Winters are quite severe in the uplands; the summers are hottest in the S.E. intramontane basins The heaviest precipitation is in the mountains, with as much as 100 in. a year in the N. uplands. The central and N. sections of the coastal strip average about 40 in. of rainfall a year, most of which occurs during the winter. Droughts are common in the S. lowlands.

Natural Resources. Albanian resources are mainly agricultural. Mineral resources have become increasingly important since exploitation began in 1945.

Plants and Animals. The native plant life of the Albanian coast consists chiefly of thickets of bushes and dwarf trees, much of which has been cleared for cultivation. Forests cover about 45 percent of the land Among the most common trees are oak, elm, pine, and birch. The eagle (for which Albania is named) is still fairly common in the mountain recesses. Wolves, bears, boars, deer, and wildfowl abound.

Soils. The lowlands of Albania are mainly alluvial and therefore are quite fertile, but their utility is lessened by many swamps and lagoons The soils deposited along the large lakes and numerous rivers are more productive. Two thirds of the area of the country is made up of vast stretches of unproductive badlands that are characterized by eroded surfaces of porous limestone and scant vegetation

Waterpower. A great potential capacity for the production of cheap hydroelectric power exists in Albania because of the many torrential streams and waterfalls. In 1971 six hydroelectric plants were in operation: the Lenin plant near Tiranë, the Karl Marx plant on the Mati R., the Friedrich Engels plant at Shkopeti, two plants at Bistritca, and the most recent, opened at Fier in 1968. The total power production in the mid-1960's averaged annually about 341,000,000 kw hours.

THE PEOPLE

The Albanians are believed to be descendants of the Thracians and ancient Illyrians. Most of the people today are divided into two branches, the Ghegs and the Tosks. The Gheg branch lives N. of the Shkumbî R., and the Tosk branch lives S. of the Shkumbî R., in the Albanian sector of Epirus. The principal minority group consists of about 20,000 to 30,000 Greeks living in the Gjinokastër region adjacent to Greece. Other scattered minorities include the Vlachs, Gypsies, Montenegrin Serbs, and Bulgars. Many Albanians continue to live in tribal organizations; the mountain-dwelling Malissores are the best-known group.

Population. Albania is the most sparsely populated of the E. European countries. The population of Albania (census 1960) was 1,626,315; the United Nations estimated (1970) 2,168,000. The overall population density is about 187 per sq. mi. (U.N. est. 1969).

Political Divisions and Principal Cities. Albania is divided into 27 districts, 198 localities, 13 towns, and 1300 villages. Largest cities are the capital and chief city Tirane, with a population of 169,300 (1967 est.); the nearby port of Durrës, 53,000; the ancient town of Shkodër, 50,000; and the seaport of Vlonë, 50,000.

Religion. About 70 percent of the people are Muslims. Albania is the only European country in which a majority of the population is non-Christian. Muslim Albanians are affiliated with

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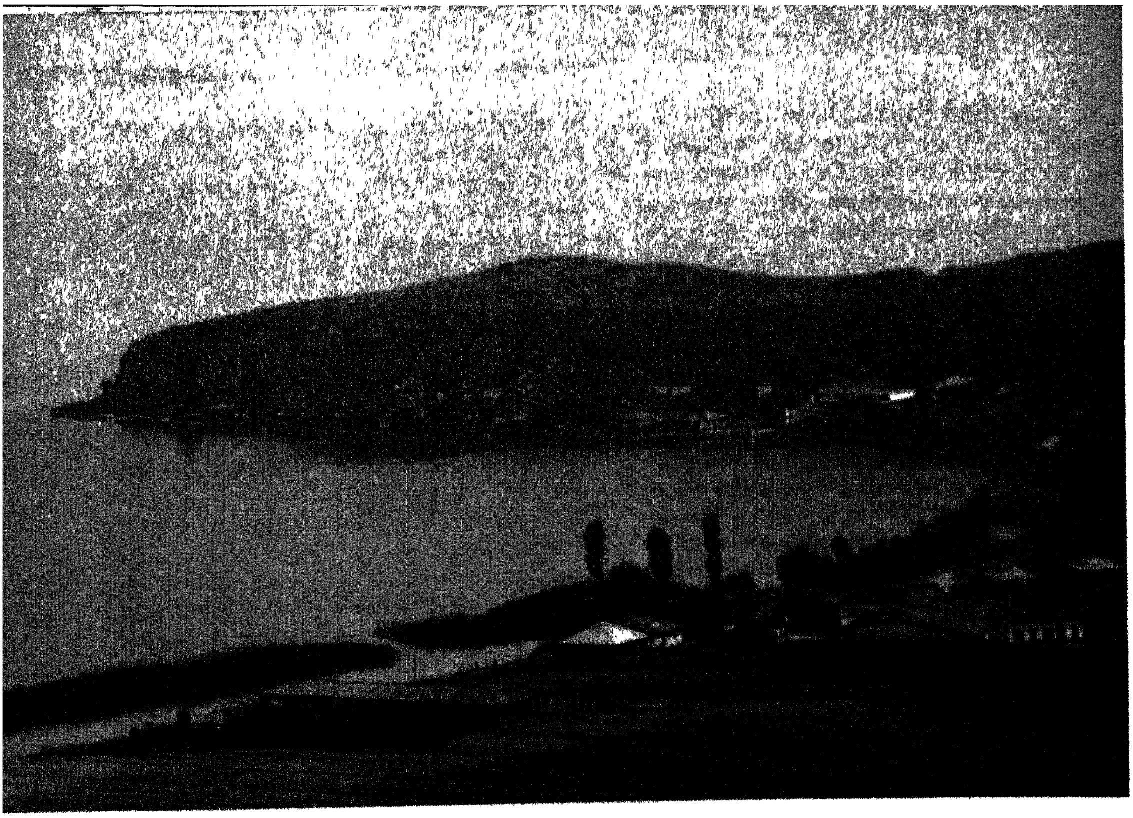


A village on Lake Ohrid, eastern Albania. The far shore (at top) is Yugoslavian territory. Malcolm J Gilson-Black Star

the Sunni branch of Islam and the Bektashi sect. The remainder of the population is Christian, about 18 percent adhere to the autocephalous (self-governing) Albanian Orthodox Church, established in 1923, and about 10 to 11 percent are Roman Catholics. In 1951 Albania severed all relations between the Albanian Roman Catholic Church and the Vatican.

Language. The Albanian language is usually classified in the Thraco-Illyrian subfamily of the Indo-European languages. The Ghegs and the Tosks speak slightly different varieties of Albanian; the Gheg form contains a marked number of Serb words, and the Tosk form has been influenced by Greek.

Education. Primary education is free and compulsory for all children between the ages of seven and fifteen. The government claims a literacy rate of 100 percent for all citizens under the age of forty. In the mid-1970's preprimary and primary schools had an enrollment of some 623,000. About 102,600 students attended secondary schools. Education is now combined with military service and work, an approach similar to the Chinese system. Some 70,000 students attended vocational and professional schools in the early 1970's; about 30,200 attended institutions of higher education, including Tiranë University with 16,000 students.

CULTURE

The cultural life of Albania has been continuously overshadowed by its larger neighbors, first the Turks and later the Russians. A renewed interest in the native culture has taken place since relations with the U.S.S.R. were severed in the early 1960's, and the government subsidizes traditional handicrafts and dances, which still dominate the art and music of the country.

Libraries and Museums. In the late 1960's according to the latest available statistics nearly 25 public libraries (including the National Library in the capital), some 200 regional and village libraries, and a number of bookmobiles were in operation. Four principal museums are located in Tiranë: the Lenin-Stalin Museum, the Museum of Archaeology and Ethnography, the Museum of Natural History, and the Museum of the Struggle for National Liberation.

Archeology. Before World War II important excavations were carried out by foreign archeologists at Hoxhara (ancient Apollonia) and at Butrint (ancient Buthrotum). The archeologists uncovered layers of Greek, Roman, Byzantine, and Venetian civilizations. After World War II, however, Albania would not allow the archeological missions to resume their activities.

Literature. The first documents in the Albanian language date from the 15th century and are religious in character. In the middle of the 19th century a literature based on secular themes began to develop An important writer during this period was Jeronim de Rada (1813-1903), who wrote poetic epics based on the ancient folk songs and heroic folk tales he collected. Another writer of verse of national themes was Zef Schirò (1865-1927)

The leaders of the movement for liberation from Turkey fought both as writers and as active revolutionaries. In the front rank of these writers was Naim Frashëri (1846-1900), who is known for his version of the story of the Albanian national hero Scanderbeg (q v).

After independence in 1912, poets of the Gheg north became prominent. An outstanding Gheg poet was Gjergj Fishta (1871-1941), who also excelled as a political writer and as an editor Fan Stylian Noli (1881-1965) translated the works of William Shakespeare and other foreign authors into Albanian. Noli also edited an Albanian newspaper in Boston, Mass. Other leading 20th-century literary figures include the symbolist poet Lasgush Poradeci, the playwright Kristo Floqi, and the novelist Foqion Postoli.

THE ECONOMY

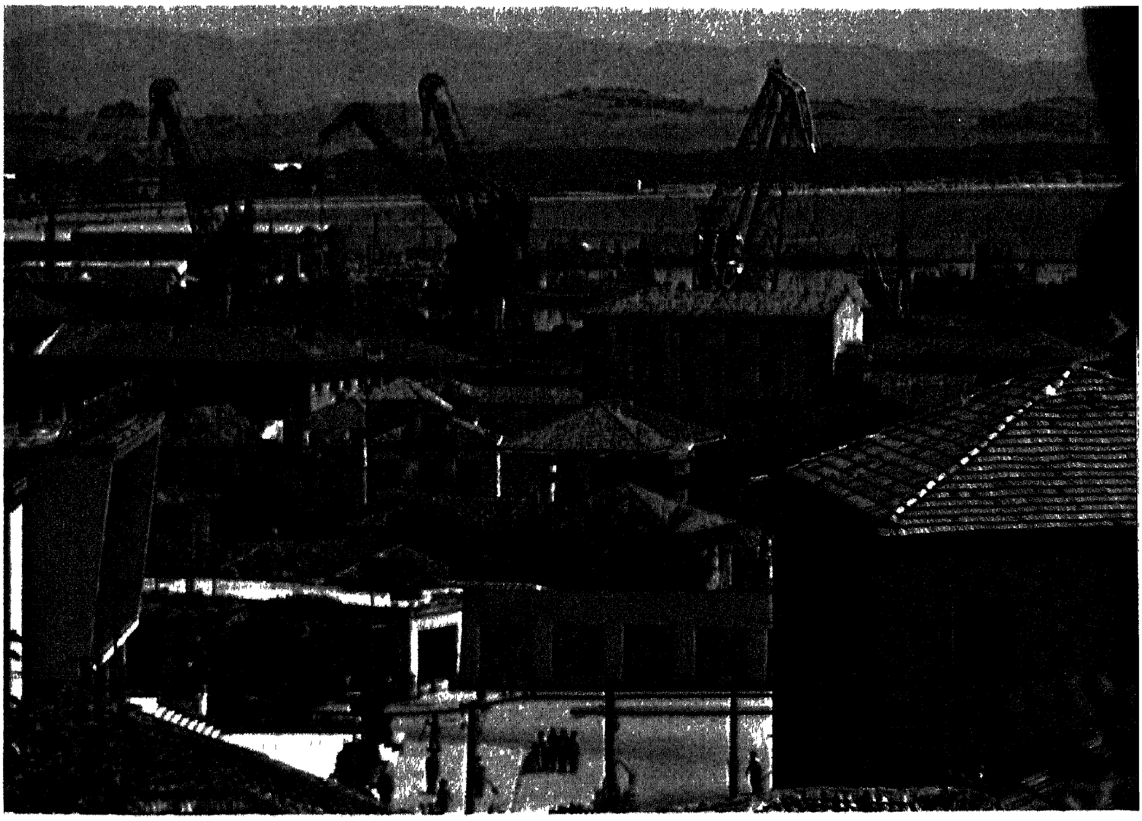
Albania is considered the poorest and least developed country in Europe. Under the Communist regime national productivity has been increased by means of a series of five-year plans initiated in 1951 During the fifth such plan (1971-75) industrial production increased by 52 percent and agricultural production by 33 percent The sixth five-year plan was initiated in 1976.

Virtually all of Albanian industry is nationalized under either the central government or organs of local government. About 90 percent of all farms have been collectivized The 1977 budget showed estimated revenues of about $1.78 billion and expenditures of some $1 54 billion.

Agriculture. Before Albania's liberation in 1944, 87 percent of its population worked in agriculture; by the late 1970's about 65 percent were still so engaged Since 1960 Albania has increased its arable land by 45 percent Over sixty reservoirs were built during 1971-75, placing 115,000 acres of land under irrigation. In 1975 more than 34,000 acres of new land were opened for cultivation. The major crops (with estimates of 1976 production) include wheat and spelt (390,000 metric tons), maize (280,000), sugar beets (140,000), potatoes (122,000), grapes (69,000), rice (18,000), and tobacco (14,000)

Animal husbandry forms a large part of the Albanian economy. In 1976 the livestock popu-

Durrës, seaport on the Adriatic, showing the main square and waterfront Malcolm J. Gilson-Black Star



lation included 1,163,000 sheep, 470,000 cattle, 117,000 pigs, 52,000 asses, and 42,000 horses. Sheep and goats provide hides, wool, mohair, milk, cheese, and meat. Egg production reached 4400 metric tons in 1976.

Forest and Fishing Industries. Timberlands cover about 30 percent of the forested areas and constitute an important natural resource of the country. The output of wood for fuel or for conversion into lumber, veneer, or other products was 1,962,000 cu.yd. in 1975. Fish are plentiful off the Adriatic coast and in the lakes and rivers. The fishing industry is managed by the state and cooperatives; the annual catch averages some 3000 tons.

Mining. Petroleum is the chief mineral wealth of Albania, in the mid-1970's the annual output of crude petroleum was 2,300,000 metric tons. Major oil fields are at Qyetë Stalin, Patos, Pekishte, and Selenice. Albania is also rich in chromium and copper, producing some 320,000 metric tons of chromium ore and 7000 metric tons of copper annually. Other minerals include lignite, limestone, asphalt, rock salt, bauxite, and pyrites.

Manufacturing. Prior to 1925 practically no industry existed in Albania. By 1940 light industry was operating on a small scale, manufactures included soap, beer, textiles, cement, and consumer goods. Since the initiation of the five-year plans, greater emphasis has been placed on the development of industry. In the late 1960's, with Communist Chinese assistance, chemical engineering plants were built to produce cement, fertilizer, and paper. Other new plants include a copper smelter, a textile combine, several cotton gins, and sugar and oil refineries. In the mid-1970's, some of the principal manufactures were cement (517,000 metric tons), petroleum products including asphalt (1.8 billion metric tons), and wine (4,225,000 gal.).

Currency and Banking. The monetary unit of Albania is the new lek, introduced in 1965 (4 leks equal U.S.$1; 1977). The Bank of the Albanian State was organized in 1945 and is the sole issuing bank; it controls all foreign transactions and aids in the preparation of financial plans for the economy. All banking and credit institutions in the country are nationalized.

Commerce and Trade. Trade relations are almost entirely with the Communist countries, particularly the People's Republic of China. The principal imports are industrial machinery and raw materials, vehicles, and consumer goods. Exports include crude oil, pig copper, chrome ore, tobacco, wine, fruits, and vegetables. In the mid-1960's, according to the latest available statistics, imports amounted to about $98,000,000 and exports to some $60,000,000.

Transportation. Some 1900 mi. of highway and 190 mi. of railroad lines link the capital with all of the major towns. The only navigable river is the Bojana, lakes Scutari, Ohrid, and Prespa are used for local shipping. Air transportation connects Tirane with Hungary, Czechoslovakia, East Germany, and Italy.

Communications. The country has about 292 postal and telegraph stations, and nearly 20 radio stations, some 13,000 telephones, 173,000 radios, and 4000 television sets are in use. Experimental television was started in 1960, and by the late 1960's programs were transmitted weekly from the station in Tiranë.

Two daily newspapers and about 50 periodicals are circulated throughout the country. *Zëri i Popullit* ("The Voice of the People") is the official organ of the central committee of the Albanian Party of Labor (A.P.L.), or Workers' Party.

Labor. Most workers belong to the Albanian trade unions, which are controlled by the Workers' Party. The aims of the unions are to increase labor productivity and production. Wages are set by the government, and workers are classified within several predetermined categories. The number of employed persons has risen sharply since World War II, reaching nearly 463,000 in the early 1970's.

GOVERNMENT

By the terms of the Albanian constitution, adopted in March, 1946, and amended in July, 1950, Albania is a people's republic. A new constitution adopted in January, 1976, officially named the country the "Socialist People's Republic of Albania." The nominal chief of state is the chairman of the presidium, who is elected by the People's Assembly. Executive power rests with the council of ministers, consisting of a chairman, deputy chairmen, and ministers. The council is also elected by the assembly.

Actual political power in Albania is exercised by the Workers' Party. Both party and country are governed by the politburo, a policy-making committee composed of 11 full members and 5 candidate members.

Health and Welfare. The government-sponsored Act on State Social Insurance of January, 1959, covers all workers and their families; medical care, disability insurance, and retirement pensions are some of the benefits. The government has taken measures to correct the problem of inadequate and insufficient medical personnel, doctors are being trained abroad, dispensaries and sanatoriums have been established, and additional hospitals are being built.

Legislature. Legislative power is wielded nominally by the unicameral People's Assembly Deputies to the assembly are elected for four-year terms by all citizens of at least eighteen years of age; each deputy represents 8000 people The assembly elects the presidium, which includes the president, 3 vice-presidents, a secretary, and 10 members The presidium exercises the functions of the People's Assembly when the latter is not in session.

Political Parties. The only political party is the Albanian Party of Labor (A.P.L), or Workers' Party Its controlling bodies are the central committee and the politburo; the former directs party activities and the latter, elected by the central committee, makes party decisions and policies. The 1976 constitution designated the party's first secretary as commander in chief of the armed forces.

Local Government. The so-called people's councils are the organs of state power at the local level. These councils are administrative bodies through which the Communist Party regulates everyday living conditions.

Judiciary. The highest judicial body of Albania is the Supreme Court, the members of which are elected by the People's Assembly for terms of four years Justice is dispensed by the people's courts and military tribunals Judges of the lower courts are elected by members of the local government over which they will preside A new penal code was adopted in 1976.

Defense. Two years of military service are obligatory for all male citizens between the ages of nineteen and thirty-five Men from thirty-five to fifty-five years of age serve in the reserves and must undergo short annual training periods In 1977, according to Western estimates, the total Albanian armed strength was about 45,000, including the army (34,000), air force (8000), and navy (3000) Internal security and border forces were estimated at 13,000

HISTORY

Little is known about the early history of the area occupied by present-day Albania. In the middle of the 3rd century B C , the Illyrians founded a kingdom on parts of the coast and in the region surrounding modern Shkoder. The Illyrians probably were an Indo-European people who had settled on the Balkan Peninsula in pre-

Ruins of a Roman amphitheater at Butrint, on the southwest coast of Albania Malcolm J Gilson-Black Star

historic times (*See also* ILLYRIA.) Some Greek colonies were founded along the coast.

Illyrian pirate ships were a danger to Roman trade. In 168 B.C., during the Third Macedonian War, Rome conquered the kingdom of Illyria and divided it into three dependent confederacies. The Romans also seized Epirus in southern Albania. The country later passed to the Byzantine (Eastern Roman) Empire, which partitioned it into the provinces of Dyrrachium and Nicopolis.

The Ostrogoths held the country during the 4th and 5th centuries A.D., but in 535 Emperor Justinian I (q.v.) reconquered it for the Byzantine Empire. The land was later invaded by the Slavs and Bulgars; the Bulgars still held part of the country in the 9th century. Foreign rule never became fully entrenched in the interior, however, and some of the fierce mountain tribes continued to live in virtual independence. From 1014 to 1204 southern Albania was again under Byzantine rule.

The kings of Sicily ruled central Albania from 1271 to 1368, during which the Serbs made inroads from the north. Under the Serbian ruler Stephen Dushan (1308?–55), a large part of Albania was subdued by 1344, but the empire disintegrated after the death of Dushan. During this time, Venetians had become firmly established on the Albanian coast, notably at Durres and Shkodër. The Venetians had enjoyed commercial privileges in these cities since the 11th century.

Turkish Rule. In the mid-15th century, when the Ottoman Turks threatened to subjugate Albania, the native tribes rallied under the leadership of the patriot Scanderbeg (q.v.) and withstood the Turks. After the death of Scanderbeg in 1468, however, the Ottomans soon gained the upper hand, even though their rule was never completely effective. During the period of Ottoman dominance a great many Albanians emigrated to southern Italy and Sicily. The majority of the population converted to Islam, and many Albanians distinguished themselves in the service of their Turkish rulers. In the 18th and early 19th centuries independent native princes ruled the country for a brief period. One of the foremost native lines was the Bushati dynasty (1760–1831) of northern Albania. Ali Pasha (1741–1822), a Turkish ruler, resisted Ottoman power in central Albania. During the 19th century the Albanians rose repeatedly in open rebellion against the Turks.

Twentieth-Century Albania. In 1912, during the First Balkan War, the Turks were virtually dislodged from the Balkan Peninsula (*see* BALKAN WARS). Albania, however, was again threatened with partition by the other Balkan countries. On Nov. 28, 1912, Albanian nationalist leaders proclaimed the independence of their country at Vlone; they were supported in this position by Austria-Hungary and Italy. The intervention of these countries antagonized France and Russia and precipitated an international crisis. In July, 1913, the European powers agreed at a conference in London to constitute Albania as an autonomous state. A German, Prince William of Wied (1876–1945), was selected by the conference to rule the country. He accepted on Feb. 21, 1914, but the Albanians refused to accept him, and he was obliged to flee from the country in September, 1914, shortly after the outbreak of World War I.

Italian Dominance. Albania, completely at the mercy of the contending powers, soon became a theater of war. At different times in the course of the conflict, various parts of the country were seized by the Austrians, Greeks, Serbs, Italians, and French. In June, 1918, Italy announced a virtual protectorate over Albania and, after the expulsion of the Austrians in the following year, occupied most of the country. A French-sponsored republic was established in the vicinity of Korce in the same year. Shortly after the end of the war the Yugoslavs seized northeastern Albania.

Despite Albanian protests, Italy and the other occupying powers refused to withdraw from the country in the immediate postwar period. Italian efforts at the Paris Peace Conference (1919) to secure a mandate over Albania were unsuccessful, mainly because of the opposition of President Woodrow Wilson (q.v.) of the United States, who also rejected Allied proposals for partition of the country.

In January, 1920, an assembly of Albanian leaders established a provisional government (regency council). Uprisings against the Italians subsequently occurred in many parts of Albania. In August Italy agreed to evacuate its forces and to recognize Albanian independence. The French had meanwhile (June, 1920) abandoned the Korçë region. Territorial disputes with Greece and Yugoslavia were adjudicated during the next few years.

Executive authority in Albania was exercised by the regency council until January, 1925. In that month a National Assembly, dominated by Ahmed Bey Zogu (1895–1961), premier of the provisional government, abolished the regency council and proclaimed a republic, with Zogu as president. The republic continued until Aug. 25, 1928, when a new constitution proclaimed Alba-

The Byzantine Church of St. Mary at Apollonia, near Fier. The area was intermittently under Byzantine rule from 535 to 1204 A D. Malcolm J Gilson-Black Star

nia a democratic, independent monarchy and Ahmed Zogu ascended the throne as Zog I. On the domestic front a broad program of cultural and economic reforms was instituted by the new monarch. His foreign policy was characterized by close collaboration with Italy. Through financial subsidies, military missions, and other means, Italy soon attained a dominant position in Albanian affairs.

Belated efforts by King Zog to halt Italian penetration of his country brought quick reprisal Italy marched into Albania on April 7, 1939. Zog I was forced into exile, and King Victor Emmanuel III (*see under* VICTOR EMMANUEL) of Italy was proclaimed king of Albania a few days later. From bases of operation in Albania, Italian troops invaded Greece, which repelled them and, in turn, invaded Albania. German troops came to the assistance of the Italians and in April, 1941, compelled Greek forces in Albania to surrender (*see* GREECE: *Modern Greece*). Albanian guerrilla troops, steadily increasing in numbers, operated against the Germans until November, 1944. In that year, because of their worsening position on other fronts, the Germans were forced to withdraw from the Balkans. The Albanian German-dominated government, which in December, 1941, had declared war on the U.S., was deposed.

The Communist Regime. A provisional government was formed by Premier Enver Hoxha (1908-), commander in chief of the resistance forces and head of the dominant, Communist-controlled National Liberation Front Party On Jan. 12, 1946, at Tiranè, a new Constituent Assembly, all seats of which had been gained by Hoxha's party in a one-slate election, proclaimed a new People's Republic of Albania. Hoxha, who resigned as head of the provisional government on Jan. 13, was then reinstated as prime minister and minister of foreign affairs of the constitutional government On Jan. 28 the United Nations Security Council rejected the Albanian request for U N. membership, which had been sponsored by the U.S.S.R. and Yugoslavia

With the formal adoption of the new constitution on March 14, 1946, the Albanian Constituent Assembly renamed itself the People's Forum of the People's Republic of Albania. Hoxha again resigned, and was commissioned to form a new government. All officers of the newly formed government were Communists; Hoxha became prime minister, minister of foreign affairs, and minister of defense. Albanian foreign relations were characterized by close alignment with the U.S.S.R. and by disputes with Great Britain and Greece. The main sources of the quarrels with Greece were the latter's claim to a region in southern Albania (Gr., North Epirus) and its contention that Albania was arming anti-government Greek forces In April, 1948, Albania refused the offer of the U N. Balkan Commission to mediate this dispute.

Albania adopted a hostile attitude toward Yugoslavia following the denunciation (June, 1948) of Yugoslav premier Tito (q.v.) by the Communist Information Bureau (Cominform), an association of the Communist parties of Europe (*see* YUGOSLAVIA *History*). On July 3, 1948, it severed trade relations with Yugoslavia, from which it had been importing most of its food. Yugoslav cultural, military, and economic missions were expelled from Albania, and wholesale arrests of pro-Tito Albanians were carried out

Albania was receiving substantial economic aid from the U.S.S.R Before the end of 1950 several thousand Soviet technicians were at work on various Albanian projects, notably the construction of large naval installations near Vlone. Political purges, arrests of alleged spies, and executions dominated internal politics during the year, and relations with Yugoslavia and Greece remained tense throughout 1950 and 1951.

Albania resumed diplomatic relations with Yugoslavia in December, 1953, and in February, 1954, the two governments concluded agreements providing for cessation of border incidents and for resumption of trade. Deputy Premier Mehmet Shehu (1913–) replaced Hoxha as premier in July, 1954, although Hoxha retained his position as head of the Communist Party. Late in 1954 Albania participated in a Moscow conference that drafted plans to establish an eight-nation Communist-defense system in the event of the remilitarization of West Germany. The system was organized in May, 1955, shortly after the admission of West Germany to the North Atlantic Treaty and Brussels Treaty organizations In 1955 Albania was admitted to the U N. In 1957 visitors from non-Communist countries were admitted to Albania for the first time since World War II.

Alliance with China. Beginning in 1959, Albania and Communist China drew closer together During the November, 1960, conference of Communist parties in Moscow, the Albanian party was the only European party reported to have sided with Communist China in its contention that world Communist domination could be achieved only through war. The stated Soviet view was that communism could be spread by peaceful persuasion and economic pressure. Albania was excluded from the next international Communist conference, held in Moscow in October, 1961, at which Albania was subjected to bitter denunciations that were interpreted widely as indirect attacks on Communist China. On Dec 10 the U.S.S.R severed diplomatic relations with Albania. Albania signed aid and trade pacts with Communist China in January, 1962.

Albania rejected the 1963 treaty limiting nuclear-weapons testing, charging that the treaty was designed to perpetuate the U S -British-Soviet monopoly on such weapons On Jan. 9, 1964, during a visit to Albania, Chinese Premier Chou En-lai (q v) signed a pact of friendship and cooperation with Enver Hoxha On Feb. 24 Albania confiscated the former embassy headquarters of the U.S S R in Tirane. It hailed the ouster of Soviet Premier Nikita S Khrushchev (q.v.) in October but on Jan 6, 1965, accused the new Soviet leaders of following Khrushchev's so called revisionist line At a congress (1966) of the Workers' Party in Tirane, party secretary Hoxha urged the pro-Chinese factions of the world Communist movement to make a final break with the U S S R In the ensuing years Albania continued its strong link with China, which was highlighted in 1971 by management of the successful campaign to gain entry for Red China into the United Nations (q v.).

ALBANO LAZIALE, town of Italy, in Rome Province, near Lake Albano about 15 miles SE of the city of Rome The town is in a summer-resort area and is the seat of a bishopric It was severely damaged during World War II. The site of ancient Alba Longa (q v) is nearby Pop. (1968 est.) 12,900.

ALBANY, city of California, in Alameda Co., on San Francisco Bay, about 6 miles N of Oakland. The city was incorporated as Ocean View in 1908 and renamed Albany in 1909 It is the site of a University of California agricultural experiment station and a United States Department of Agriculture chemurgic research laboratory. Pop. (1960) 14,804; (1970) 14,674

ALBANY, city in Georgia, and county seat of Dougherty Co., on the Flint R , about 170 miles S of Atlanta Albany is on several railroad lines and has two airports It is the business center of an agricultural region noted for the growing of pecans, peanuts, peaches, and cotton, and the raising of livestock. The main industries in the city include food processing and the manufacture of hosiery, cotton thread and cloth, aircraft, rubber tires, golf clubs, and pine lumber. The city is the site of Albany State College, Turner Air Force Base, and a United States Marine Corps supply depot Albany was founded about 1836 and incorporated in 1841 Pop. (1960) 55,890; (1970) 72,623

ALBANY, city and capital of New York State, and county seat and port of entry of Albany Co., on the W bank of the Hudson R., about 145 miles N. of New York City An important commercial center, Albany is served by four railroads and by several airlines Local industries include printing and publishing, meat processing, and the manufacture of automotive accessories, machine tools, and paper, felt, and steel products Important buildings are the State Capitol, the State Education Building, the Governor Alfred E. Smith State Office Building, All Saints' Cathedral, and the Schuyler Mansion. The chief institutions of higher learning are the medical, pharmacy, and law schools of Union University, the administrative office of the State University of New York and a division of the university (*see* NEW YORK, STATE UNIVERSITY OF), and the College of Saint Rose.

Dutch fur traders established a blockhouse, called Fort Nassau, near the site of present-day Albany in 1614 but abandoned it in 1617. Colonization of the site began with the founding of Fort Orange in 1624; Beverwyck, the community that developed around the fort, thus became the second permanent settlement (after Plymouth) in the region later comprising the thirteen colonies. In 1664, when Great Britain seized New Netherland from the Dutch, Beverwyck was renamed Albany in honor of the duke of York and Albany, later James II (q.v.), King of England. It was granted a city charter in 1686. In 1754 it was the scene of the Albany Convention (q.v.). Albany became the State capital in 1797. Pop. (1960) 129,726; (1970) 114,873.

ALBANY, city in Oregon, and county seat of Linn Co., on the Willamette R., about 21 miles S. of Salem. Situated in an orchard and farm area, Albany is a trading and processing center for lumber, poultry, dairy, and meat Manufactures include furniture and leather goods, and zirconium and titanium are mined. It is the site of an experimental station of the United States Bureau of Mines. Pop. (1970) 18,181.

ALBANY, river of N. Ontario, Canada, 982 km (610 mi.) long. The river rises in Lake Saint Joseph and flows E. before emptying into James Bay, near Fort Albany. It was once an important route for fur traders.

ALBANY CONVENTION, first attempt at an intercolonial union of the American colonies. Commissioners from Massachusetts, Connecticut, New Hampshire, Rhode Island, Maryland, and New York adopted at Albany, N.Y., July 11, 1754, a plan of union proposed by the American diplomat Benjamin Franklin (q.v.). It provided for a Grand Council of representatives from the colonies, headed by a president-general to be appointed by the British king. Both the British government and the colonies rejected the Franklin plan, each contending that it gave the other too much power

ALBANY REGENCY, popular name for a group of Democratic Party politicians whose activities were centered in Albany, N Y., and who took a leading part in national and New York State politics between 1820 and 1850 The Regency was one of the earliest effective political machines in the United States. Most of its members simultaneously held public offices and party positions, using both to bolster their own private fortunes and those of their party. Among its prominent members were Martin Van Buren (q v.), who rose from State office to the U.S Presidency, and William Marcy (q.v), who became governor of New York State and cabinet officer under Presidents James Knox Polk and Franklin Pierce (qq v.). A split in the New York Democratic Party after 1844 weakened the Regency, and it eventually was dissolved

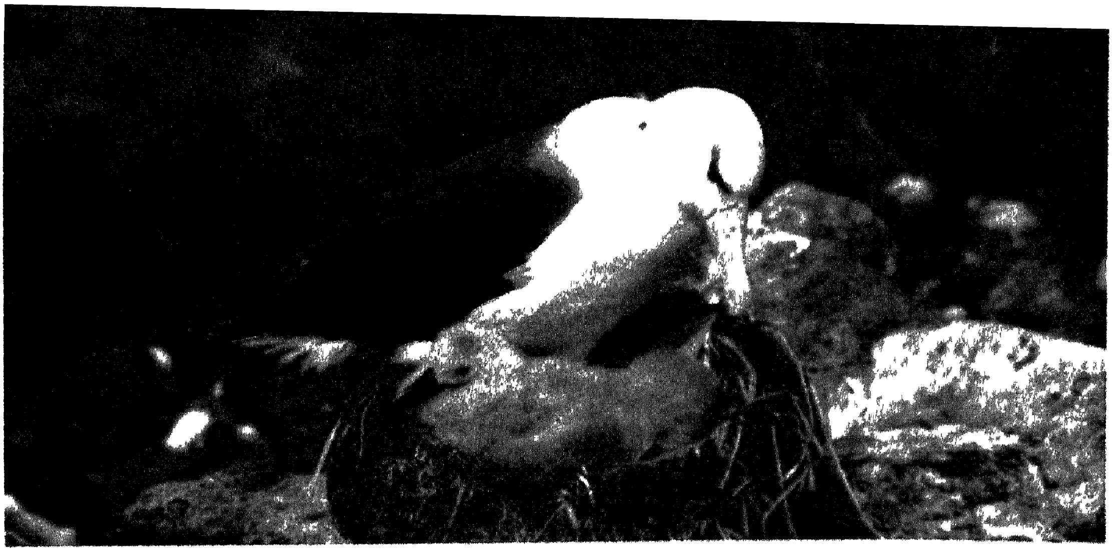
ALBATEGNIUS. *See* AL-BATTĀNI

ALBATENIUS. *See* AL-BATTĀNI.

ALBATROSS, common name applied to large seabirds of the family Diomedeidae in the order Procellariiformes, which includes also the petrel and the shearwater (qq.v.) The bill of the albatross is characterized by a markedly hooked upper mandible with tubular nostrils protruding from the base. The feet are strongly webbed and lack a hind claw; the wings are long and narrow. Thirteen species of albatross can be found mainly throughout seas of the Southern Hemisphere, from the Antarctic region north to the tropics.

Albatrosses are nomadic birds that spend months wandering great distances over the oceans. They sleep on the ocean surface, drink seawater, and feed on cuttlefish, other small marine animals, and refuse from ships. They return to land only to breed, at which time they perform a stylized courting ritual of elaborate bowing and posturing. The albatross nests on barren islands, close to shore; the nest usually is a depression in the ground containing a single egg. When hatched, the nestling is covered with brownish down, and it grows to adulthood relatively slowly.

The ability of some species to zigzag across a strong headwind has long fascinated mariners. Albatrosses often follow a ship for days, diving steeply into the water to recover refuse from the wake of the ship. The birds are easily caught with baited hook and line; captured birds usually are released, however, because of a superstition commonly held by sailors that killing an albatross brings bad luck. The superstition forms the theme of *The Rime of the Ancient Mariner*



Hen and chick of the black-browed albatross, Diomedea melanophrys, *which is native to the Falkland Islands*
Francisco Erize-Bruce Coleman Inc

by the British poet Samuel Taylor Coleridge (*see under* COLERIDGE).

Well-known species include the wandering albatross, *Diomedea exulans,* a huge bird with a 12-ft. wingspread. The plumage of this seabird is white with black wing tips, and there are pink or orange patches on the sides of the head. The Laysan albatross, *D. immutabilis,* is a smaller, brown-winged species with a sooty-black spot near the eyes and a gray bill. Another smaller species is the black-footed albatross, *D. nigripes.*

AL-BATTĀNĪ, ABU-'ABDULLĀH MUHAMMAD IBN-JĀBIR, known also as ALBATEGNIUS *or* ALBATENIUS (about 850–929), leading Arab astronomer and mathematician of his time. His astronomical observations at El Rashid, Syria, extended over a period of forty years. He also made important contributions to pure mathematics. He introduced the use of sines in mathematical calculations, computed a table of cotangents, and formulated certain propositions in spherical trigonometry. His astronomical works, published as *De Motu Stellarum* ("Concerning the Motion of the Stars", 1537), corrected errors of the Alexandrian astronomer Ptolemy (q.v.) in regard to the obliquity of the ecliptic and the length of the tropical year.

ALBEE, Edward Franklin (1928–), American playwright, born in Washington, D.C., and adopted as an infant by the American theater executive Reed A. Albee (d. 1963) of the Keith-Albee chain of vaudeville and motion-picture theaters. Albee attended a number of preparatory schools and, for a short time, Trinity College in Hartford, Conn. He held a variety of jobs after he left college, including a three-year period as a Western Union messenger. He wrote his first one-act play, *The Zoo Story* (1959), in a period of three weeks. Among his other plays are the one-act *The American Dream* (1961); *Who's Afraid of Virginia Woolf?* (1962), *The Ballad of the Sad Café* (1963), adapted from a novel by the American author Carson McCullers (q.v.), *Tiny Alice* (1964) and *A Delicate Balance* (1966), for which he won the 1967 Pulitzer Prize in drama. For *Seascape* (1974), which had only a brief Broadway run, Albee won his second Pulitzer Prize. His early plays were marked by themes typical of the so-called theater of the absurd, in which characters suffer from an inability or unwillingness to communicate meaningfully or to sympathize or empathize with one another. His most successful plays are focused on familial relationships.

ALBEMARLE, town of North Carolina, and county seat of Stanly Co., about 37 miles N.E. of Charlotte. Albemarle is the marketing center for grain, timber, and dairy products produced in the surrounding area. Manufactures include textiles, aluminum products, and furniture. Morrow Mountain State Park is nearby. Albemarle was incorporated in 1842. Pop. (1980) 12,261; (1970) 11,126.

ALBEMARLE SOUND, inlet of the Atlantic Ocean, in N.E. North Carolina. Albemarle Sound extends inland for about 60 mi.; the width varies from 4 to 15 mi. Depths seldom exceed 20 ft., and in many sections are less than 5 ft. A narrow island at the mouth prevents the sound from being affected by the tides. The Roanoke and Chowan rivers flow into the upper extremity. The sound is connected by channels with Currituck and Pamlico sounds.

ALBÉNIZ, Isaac (1860–1909), Spanish composer and pianist, born in Camprodón, and trained at the Brussels Conservatory. He also studied under the Hungarian composer Franz

Liszt (q.v.). Albéniz was a prolific composer. Among his most important compositions are *The Magic Opal* (1893), a comic operetta, *Iberia,* twelve pieces for piano published between 1906 and 1909, *Catalonia,* a rhapsody for orchestra, and *Pepita Jiménez* (1896), an opera.

ALBERT I (1875–1934), King of Belgium, nephew of Leopold II (*see under* LEOPOLD), King of Belgium. He was born in Brussels and educated privately and at the École Militaire. Before his accession to the throne he bore the title Count of Flanders. His democratic manner made him the most popular member of the reigning house. He traveled widely and was a student of politics and economics. In 1898 and again in 1919 he visited the United States. During 1900 he made an extended tour of the Belgian Congo and upon his return to Belgium urged the need of railroad development and of reform in the treatment of the Congolese; when he became king he ordered many improvements in the administration of this colony (*see* ZAIRE, REPUBLIC OF). On the death of Leopold II in 1909, Albert became king of Belgium.

Albert was the first European ruler to warn of the impending World War I. During 1913, while visiting in Germany, he was informed of the plans for war by William II (q.v.), Kaiser of Germany. He immediately warned France, and on July 31, 1914, sent a personal letter to the kaiser informing him that Belgium would remain neutral. When the letter was ignored and German troops poured into Belgium, Albert assumed active command of his army and directed a successful delaying action against the invasion. He remained with his troops for the duration of the war.

After World War I he played an active role in the reconstruction of his country, and in 1919 made a plea to the Allies for the abolition of the Treaty of London, which made Belgium neutral ground and thus vulnerable to invasion. The appeal was granted by the Allies, and the abolition of the treaty was incorporated into the Treaty of Versailles (*see* VERSAILLES, TREATY OF). Throughout the 1920's Albert supported general industrial expansion and the development of a strong merchant fleet as the best methods of national recovery. In 1934 he was killed by a fall while mountain climbing. He was succeeded by his eldest son as Leopold III (*see under* LEOPOLD).

ALBERT, name of two Holy Roman emperors.

Albert I (1250?–1308), Holy Roman Emperor (1298–1308), Duke of Austria (1282–1308). He received the duchy of Austria in 1282 from his father, Rudolf I of Hapsburg (q.v.), King of Germany and Holy Roman Emperor. After Rudolf's death in 1291, the German Imperial Electors refused to recognize Albert's claims to the throne and named Adolf of Nassau (1250?–98) king of Germany. With the help of a coalition of German princes, Albert deposed and succeeded Adolf in 1298. Pope Boniface VIII (*see under* BONIFACE) recognized him as Holy Roman Emperor in 1303, but he was never crowned. During his reign he adopted measures beneficial to the serfs, Jews, and the mercantile class, obtained the crown of Bohemia for his son, and in 1307 waged an unsuccessful war against Thuringia (q.v.). He was murdered by a nephew whose inheritance he had withheld.

Albert II (1397–1439), Holy Roman Emperor (1438–39), and Duke of Austria as Albert V (1404–39). He inherited the duchy in 1404 and in 1437 succeeded his father-in-law, the Holy Roman Emperor Sigismund (q.v.) as King of Bohemia and Hungary. In 1438 he became king of Germany. Although recognized as Holy Roman Emperor, he was never crowned. During Albert's brief reign, the Poles and Turks invaded Bohemia and Hungary, respectively.

ALBERT (1828–1902), King of Saxony (1873–1902). He was noted for his military ability. At the age of twenty-one he served as captain in the army of the duchies of Schleswig and Holstein in their war against the Danes (*see* SCHLESWIG-HOLSTEIN). In 1866, during the Seven Weeks' War (q.v.) between Austria and Prussia, Albert commanded a Saxon corps which distinguished itself at the decisive battle of Königgrätz (now Hradec Králové, Czechoslovakia) by a firm stand against the Prussians. In the Franco-German War (q.v.) of 1870–71, in which Saxony fought on the side of Prussia, Albert commanded the Saxon army which helped defeat the French at Gravelotte, France. He was then placed in command of the so-called Fourth Army, which fought at Sedan, France, and took part in the siege of Paris. After the armistice, Albert commanded the German army that occupied France, and upon the declaration of peace he became an inspector general and field marshal of the German army.

ALBERT III (1414–86), Elector of Brandenburg (1470–86), born in Tangermünde. He was nicknamed Achilles or Ulysses, because his extraordinarily shrewd mind and unusual physical strength gave him in contemporary eyes a resemblance to these Greek heroes. In 1440, on the death of his father, Frederick I (1372–1440), the territorial possessions of the Hohenzollern family were divided among Frederick's three sons. Brandenburg went to Albert's brother

Frederick, who became the Elector Frederick II (1413–71); the principality of Bayreuth went to Albert's brother John (d. 1464); and Albert received the principality of Ansbach. The lands of his brothers eventually came into Albert's possession, he inherited Bayreuth from John, and received Brandenburg through the abdication of Frederick II in 1470. Albert strengthened the Hohenzollern hold on Brandenburg by warring against independent towns and princes and by providing against a possible dispersal of the family lands after his death. He secured the future of Hohenzollern lands by his *Dispositio Achillea* ("The Political Testament of Achilles"), made public in 1473, by which he provided that Brandenburg should at his death go intact to his oldest son, and the Franconian lands (see FRANCONIA) of the Hohenzollerns go intact to the younger, and that in all succeeding generations both parts of the family holdings should descend only to oldest sons. By this declaration Albert established among the noble families of Germany the principle of primogeniture (q.v.).

ALBERT (1490–1545), known as ALBERT OF BRANDENBURG, Archbishop of Magdeburg and Archbishop and Elector of Mainz. He was the younger son of the elector of Brandenburg. In 1513 he became archbishop of Magdeburg. The following year he became archbishop and elector of Mainz, and in 1518 he was named a cardinal. In order to pay the expenses involved in obtaining high office, he was granted permission by the pope to sell indulgences. Among his agents in this enterprise was the German monk Johann Tetzel (q.v.), against whom the theses of the German religious reformer Martin Luther (q.v.) were directed. In the ensuing struggle between Catholics and Protestants, Albert adhered to the Roman Catholic Church, but acted as peacemaker between the two factions at the Imperial Diet at Augsburg in 1530. Albert was the first German ruler to receive Jesuits in his dominions. Despite his loyalty to the Church, he granted religious liberty to his subjects, many of whom were Protestants, on condition that they pay his debts of about half a million florins.

See also CHRISTIAN CHURCH, HISTORY OF THE; REFORMATION.

ALBERT, in full ALBERT FRANCIS CHARLES AUGUSTUS EMMANUEL OF SAXE-COBURG GOTHA (1819–61), Prince Consort to Victoria (q.v.), Queen of England. He was born near Coburg, (now in West Germany), a younger son of Ernest I (1784–1844), Duke of Saxe-Coburg-Gotha. In 1840 he married Victoria, who had been queen for three years and he soon became one of her most trusted advisers. At the time of his marriage Prince Albert received the title of Royal Highness and was naturalized as a subject of Great Britain. The title of Consort of Her Most Gracious Majesty was formally conferred in 1842, and that of Prince Consort in 1857. The prince was a patron of the arts and sciences and encouraged many public undertakings. He died of typhoid fever at Windsor Castle (q.v.), the royal residence.

ALBERTA, province of Canada, bounded on the N. by the Northwest Territories, on the E. by Saskatchewan, on the S. by the State of Montana, and on the W. by British Columbia. Alberta is a wholly inland territory and the most westerly of the three Prairie Provinces of Canada. Alberta is 760 mi. in length, and it ranges in breadth from 180 mi. along the international boundary, to 400 mi. The area is 255,285 sq.mi., including 248,800 sq.mi. of land and 6485 sq.mi. of water surface.

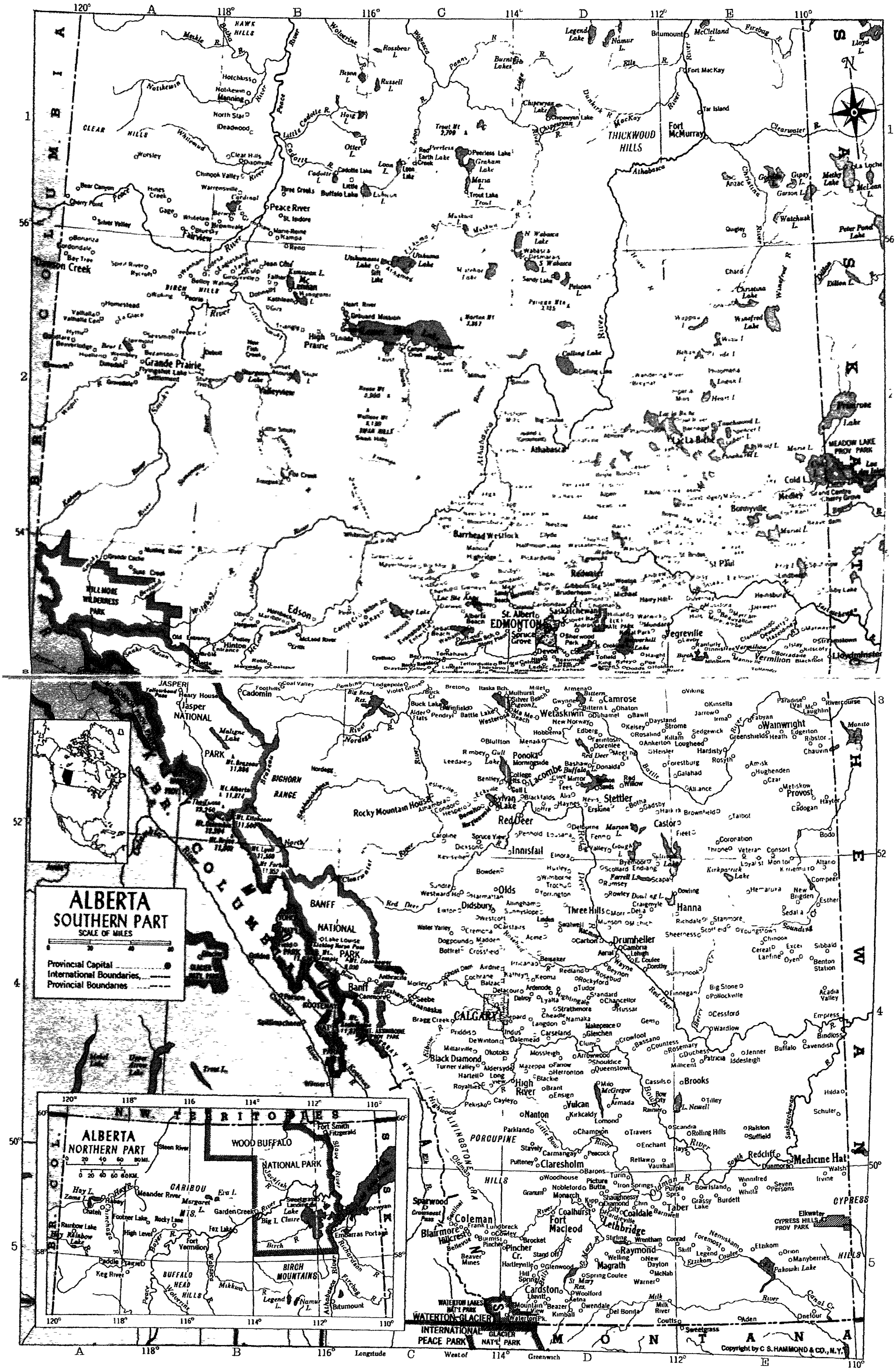
THE LAND

The three main topographical features are the Rocky Mountains (q.v.), rising to 8000 and 10,000 ft., with many peaks higher than 11,000 ft., along the W. boundary; the Great Plains, constituting the major land area; and a small portion of the Canadian Shield (q.v.) in the extreme N.E. corner, around Lake Athabasca (q.v.). Mount Columbia (12,294 ft.) and The Twins (12,085 ft.) are among the outstanding peaks of the Rocky Mts. Between the Rockies and the plains is a region of foothills, which is narrower and higher in the S. part of the province.

Two thirds of the province is a plateau scored deeply by the tributaries of three major river systems. The plains average about 2500 ft. above sea level and rise toward the W. to about 4000 ft. at the foothills. The land drops abruptly in the N.E. to 700 ft. above sea level at Lake Athabasca. The valleys of the South Saskatchewan and Red Deer rivers are 300 to 400 ft. deep.

Rivers and Lakes. The rivers of Alberta are constituents of three major North American river systems: the Mackenzie and Saskatchewan, and the Mississippi (qq.v.). The chief tributaries in Alberta of the Mackenzie R. are the Athabasca, the Hay, and the Peace (qq.v.) rivers. The Athabasca R. rises in Jasper National Park and flows 765 mi. to Lake Athabasca. The Saskatchewan has two main branches in Alberta, the North Saskatchewan and the South Saskatchewan. The Milk R. drains a small area in the S., then flows southward to the Missouri.

The major lakes of the province are situated in the central and N. regions. The largest lake wholly within Alberta is Lake Claire, 545 sq.mi. in area, in the N.E. About 940 sq.mi. of Lake Atha-


ALBERTA
SOUTHERN PART
SCALE OF MILES
Provincial Capital
International Boundaries
Provincial Boundaries
ALBERTA
NORTHERN PART
N.W. TERRITORIES
WOOD BUFFALO
NATIONAL PARK
CARIBOU MTS.
BIRCH MOUNTAINS
BUFFALO HEAD HILLS
Fort Smith
Fitzgerald
Steen River
Meander River
High Level
Fort Vermilion
Keg River
Paddle Prairie
Garden Creek
Rainbow Lake
Embarras Portage
Bitumount
Hay L.
Zama L.
Chateh
Footner Lake
Rocky Lane
Fox Lake
Sweetgrass Landing
Big L. Claire
Peace River
Athabasca River
Fort McMurray
Fort MacKay
Tar Island
THICKWOOD HILLS
Clearwater R.
Peace River
Manning
Hotchkiss
Notikewin
North Star
Deadwood
Worsley
CLEAR HILLS
Fairview
Grimshaw
Dawson Creek
Grande Prairie
Beaverlodge
Sexsmith
Spirit River
Falher
McLennan
Donnelly
High Prairie
Valleyview
Lesser Slave Lake
Slave Lake
Athabasca
Lac La Biche
Bonnyville
Cold L.
MEADOW LAKE PROV. PARK
Barrhead
Westlock
Redwater
St. Paul
Vegreville
Vermilion
Lloydminster
Edson
Hinton
WILLMORE WILDERNESS PARK
St. Albert
EDMONTON
Spruce Grove
Devon
Sherwood Park
Fort Saskatchewan
Wabasca
Calling Lake
Swan Hills
Whitecourt
Mayerthorpe
Wetaskiwin
Camrose
Ponoka
Lacombe
Stettler
Red Deer
Sylvan Lake
Rocky Mountain House
Innisfail
Olds
Didsbury
Three Hills
Hanna
Drumheller
Castor
Coronation
Provost
Wainwright
JASPER
Jasper
JASPER NATIONAL PARK
BIGHORN RANGE
BANFF NATIONAL PARK
Banff
Canmore
Lake Louise
Cadomin
CALGARY
Cochrane
Okotoks
High River
Black Diamond
Turner Valley
Nanton
Vulcan
Claresholm
PORCUPINE HILLS
Fort Macleod
Lethbridge
Coaldale
Taber
Brooks
Medicine Hat
Redcliff
Bow Island
CYPRESS HILLS PROV. PARK
Elkwater
Pincher Cr.
Coleman
Blairmore
Sparwood
Crowsnest Pass
Cardston
Magrath
Raymond
Milk River
Coutts
WATERTON LAKES NAT'L PARK
WATERTON-GLACIER INTERNATIONAL PEACE PARK
GLACIER NAT'L PARK
M O N T A N A
S A S K A T C H E W A N
B R I T I S H   C O L U M B I A
Longitude West of Greenwich
120° 118° 116° 114° 112° 110°
56° 54° 52° 50°
A B C D E
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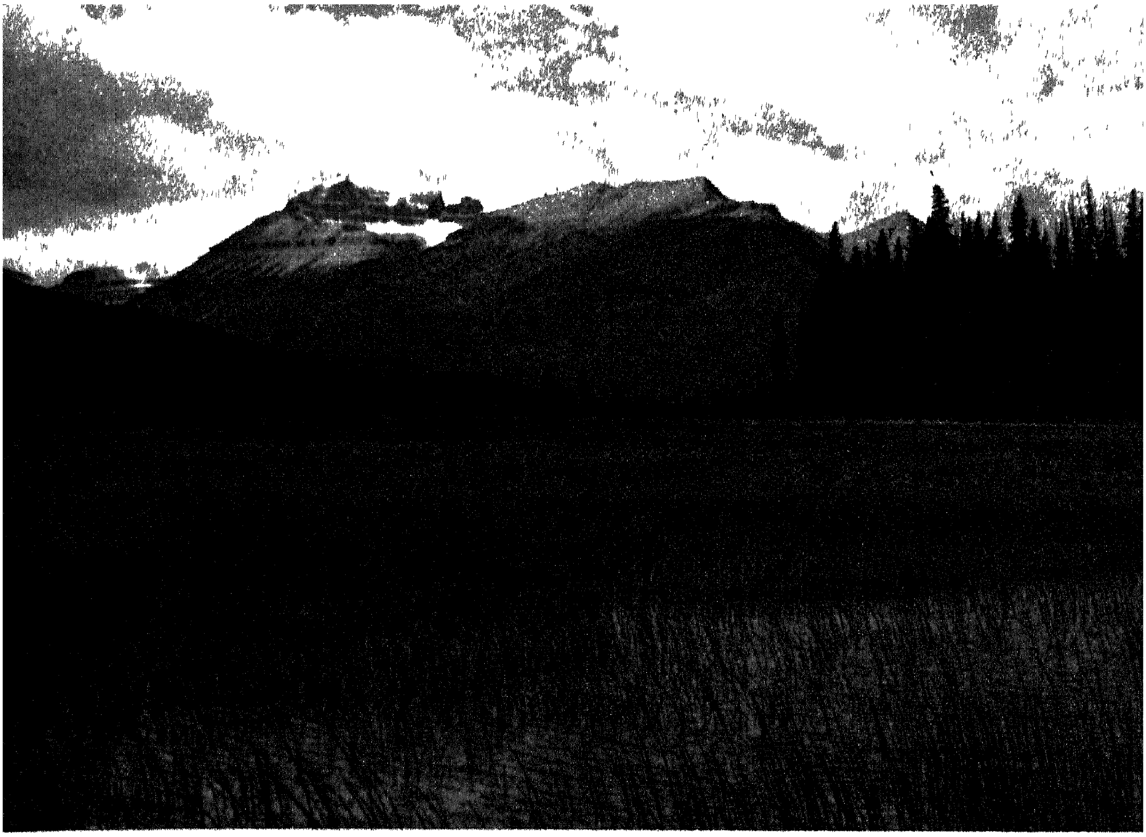


The great Saskatchewan river system is represented in Alberta by the South and North Saskatchewan rivers The valley of the latter is shown here, with Mt. Saskatchewan in the background K Gunnar–Bruce Coleman, Inc

basca (total area, 3064 sq.mi.) are in Alberta; the remainder is in Saskatchewan. Also in Alberta are Lesser Slave Lake, with an area of 461 sq.mi., and Cold Lake with a total area of 138 sq.mi., 92 sq.mi. of which are in Alberta. Lake Bistcho, located in the N.W. corner of the province, has an area of 165 sq.mi.

Climate. Throughout the year the climate varies considerably from N. to S. In the N. and central regions the mean annual temperature is 35° F.; S. of Calgary the annual mean is 40° F., except in the Rocky Mts., where it is 30° F. Winters are severe throughout the province; the January mean temperature ranges from −10° F. in the N. to 7° F. at Edmonton, 14° F. at Calgary, and 16° F. at Lethbridge. In the summer the July mean is 65° F. throughout the province, except in the extreme N.W. and the Rockies, where it averages 55° F., and in the S.E., where it is about 70° F. The average frost-free period varies from 90 days in the N. to 130 days in the S.

The amount of precipitation varies likewise from N. to S. The area of the province N. of a line running westward from the tip of Lake Athabasca receives 13 in. of precipitation annually; the Peace R. area, 14 to 17 in.; east-central and southern Alberta, including Edmonton, Calgary, and Lethbridge, S. to the U.S. border, 17 to 19 in.; the extreme S.E. corner, less than 14 in.; and the foothills and mountain regions, 20 to 22 in.

Plants. Short and mixed grasses grow in the region S. of Calgary and E. of the foothills. Between Calgary and Edmonton, in a band that widens like a cornucopia opening on the Saskatchewan boundary, is a wide variety of wheat, brome, and reed grasses, flowering cinquefoil, anemone, vetch, and sweet pea. Larger vegetation consists of aspen, black poplar, Saskatoon bush, highbush cranberry, willow, bur oak, Manitoba maple, elm, and green ash. These species also are found in patches in the province, particularly in the Peace R. area. From Edmonton northward, except for the N.E. corner, a mixture of deciduous and coniferous woods is found, including poplar and spruce, lodgepole pine, Alpine fir, whitebark pine, Alpine larch, Douglas fir, willow, hazel, cranberry, and rose. West of Edmonton poplars and evergreens are found. Mosses and lichens are common and form a spongy muskeg. In the S.E. region the Cypress Hills are an island of mixed woods in the grass plains. In the N.E. area white spruce, balsam fir, black spruce, tamarack or larch, jack pine, and white birch cover vast tracts of land. Engelmann spruce grows on the mountain slopes. The forests of Alberta are of great importance because they retard the runoff on the E.

slopes of the Rocky Mts. and thus regulate and conserve the flow of water in the province's streams and rivers.

Animals. Much of the province is a natural fur-producing area. Larger animals of Alberta include the caribou, bison, antelope, moose, deer, elk, and bear. Timber wolves, coyotes and foxes, muskrats, squirrels, beavers, weasels, and smaller rodents, such as mice and gophers, are common. Ducks, geese, and upland fowl, such as prairie chicken, partridge, and pheasant, are abundant in the summer and fall. Whitefish, lake trout, pike, pickerel, and tullibee are the common fish in Alberta lakes.

Parks and Other Places of Interest. The four national parks in Alberta cover a total area of 20,792 sq mi. Banff National Park, in the S.W. section of the province, totals 2564 sq.mi. in area and attracts tourists from many countries. Jasper National Park, a larger mountain park 235 miles W. of Edmonton, has an area of 4200 sq.mi. Waterton Lakes National Park (203 sq.mi.) is contiguous with Glacier National Park in the State of Montana. Elk Island National Park (75 sq.mi.) is a fenced game preserve in central Alberta, about 30 miles E. of Edmonton. In the far N., divided by the border between Alberta and the Northwest Territories, is Wood Buffalo National Park. The park covers 17,300 sq mi., of which 13,650 sq.mi are in Alberta, and it is the home of the largest remaining herds of plains and wood bison in North America. Besides the national parks, 51 parks, 26 historical sites, and 9 wilderness areas have been developed by the provincial government. The E. slopes of the Rockies have forest reserves totaling 9525 sq mi. in area. On the Banff Jasper Highway tourist travel is permitted to a limited degree during the summer months. Of the numerous glaciers seen from this road, the Athabasca glacier, part of the Columbia icefield, is the most accessible. The badlands, near the city of Drumheller, also provide a spectacular sight.

THE PEOPLE

According to the June 1976, Federal census, the population of Alberta was 1,838,037. The population density of the province was 6.6 persons per sq mi., the density rises to some 390 times this figure in the larger urban centers. Of the total population, about 83 percent was born in Canada, 4 percent in the British Isles, 3 percent in the U.S., 2 percent in Germany, and most of the remainder in the U.S.S.R., Poland, and the Netherlands. About 47 percent of the citizens claims British origin, the second largest national group is German, which comprises about 14 percent. Other large groups are Ukrainian, French, Scandinavian, Dutch, and Polish. About 3 percent of the population is of Indian or Eskimo (Inuit) origin.

About 74 percent of the population is classified as urban. The principal cities are the capital, Edmonton (1976 pop. 461,361), Calgary

Moraine Lake, whose exquisite setting makes it a primary attraction of Banff National Park, along the British Columbia border. Halle Flygare-Bruce Coleman, Inc

A night view of the Edmonton skyline showing (at right) the domed legislative building

Photo Services, Government of Alberta

(469,917), Lethbridge (46,752), Medicine Hat (32,811), Red Deer (32,184), and Grande Prairie (17,626).

Education and Cultural Facilities. The educational system of the province provides for public and separate schools from the first grade through high school. The separate schools usually are Roman Catholic; but in areas where the Roman Catholic population predominates, the public school is Catholic and the Protestant school, if population is sufficient to warrant one, is the separate school. Education in provincially supported schools is compulsory and free. The curriculum is selected and supervised at the provincial level, with administration of plant and staff conducted at the local level.

ELEMENTARY AND SECONDARY SCHOOLS. In the mid-1970's, Alberta had 1300 elementary and secondary schools with an annual enrollment of about 417,800 students. Courses in the pure, practical, and social sciences are provided by the high schools, as are optional courses in the technical, business, and homemaking fields.

COLLEGES AND UNIVERSITIES. In the mid-1970's total enrollment in Alberta's colleges and universities was about 30,000 students. The most important schools are the University of Alberta (enrollment, 20,166) in Edmonton, the University of Calgary (enrollment, 10,982) in Calgary, and the University of Lethbridge (enrollment, 1,336) in Lethbridge. There are a number of public junior and community colleges that offer a year or two of study beyond high school; Athabasca University offers extension courses.

Courses in the fine and performing arts are offered by the Banff School of Fine Arts, associated with the University of Calgary, and by the Alberta College of Art and the Southern Alberta Institute of Technology, both in Calgary

LIBRARIES AND MUSEUMS. Alberta has more than 150 public libraries. The University of Alberta campus is the site of Rutherford Library, which includes the faculty libraries and an extension library. The provincial government maintains the legislative library in the legislature buildings in Edmonton, and the Alberta Law Society has law libraries in major centers of the province Among the main museums is the Banff National Park Museum of Natural History in Banff. Civic art centers are located in Calgary (the Allied Arts Centre and Art Gallery, Coste House) and Edmonton (the Edmonton Museum of Arts)

THE ECONOMY

The economy of Alberta was almost completely agricultural until 1947, when the discovery of large oil pools resulted in the establishment of new industries. In the mid-1970's about 14.3 percent of the total labor force was engaged in agriculture, 4.4 percent in other primary industries, 9.6 percent in manufacturing, 7.4 percent in construction, 9.0 percent in transportation, 17.3 percent in trade, and 38.0 percent in service.

Hydroelectric power potential has been extensively developed on the Bow, Cascade, and Kananaskis rivers. The Big Bend development on the Brazeau R. has an installed annual capacity of more than 300,000 kw. Despite these resources, thermal power accounted for about 87 percent of all power generated in the province in the mid-1970's. A coal-fired generating station was under construction at Dodds, S.E. of Edmonton. Total generating capacity was 3,300,000 kw.

Manufacturing. The total value of shipments of manufactured goods in the mid-1970's was about $3.4 billion. Food and beverage processing and manufacturing accounted for $1.2 billion, about 38 percent of the total output. Other important industries were petroleum refining ($433,000,000); primary metals and metal fabricating ($425,000,000); wood products ($172,000,000); nonmetallics, mainly structural materials ($153,000,000); transportation equipment ($153,000,000), printing and publishing ($126,000,000); and paper manufacturing ($119,000,000).

Meat processing and packing constitutes a major part of the food industry in the province; canning and freezing produce from S. Alberta comprises another large sector of the food-processing industry. Beer and liquor making, breakfast-cereal production, flour milling, and sugar-beet refining are also important. With the development of the petroleum industry, oil refineries were established for the production of lubricating oils and gasolines. Natural gas is broken down and constituent parts are used in the production of cellulose acetate fibers, chemicals, and plastics. Other industries include box making, the processing of dairy products, garment making, lumber milling, and the manufacture of glass and pottery. Cement plants are located near Banff and Edmonton.

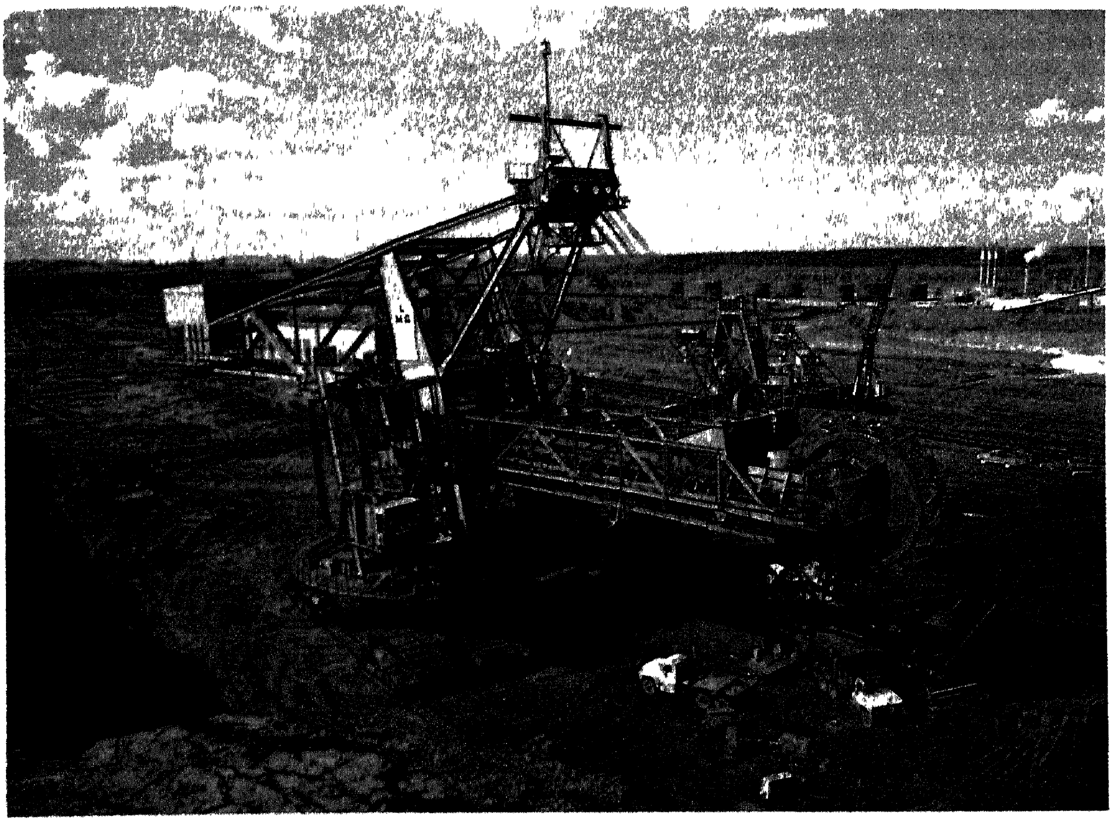
Agriculture. About 238,000 persons were living on more than 62,500 farms in Alberta, according to the 1971 census. Farms of 560 acres or larger numbered over 16,000. Total cash receipts from farm operations in Alberta in the mid-1970's were nearly $2 billion annually. The total was divided almost equally between crops ($992,000,000) and livestock production ($921,000,000). The growth of farm income in the province has been rapid, in 1970 total receipts were only $705,000,000. Alberta's agriculture is highly modern and mechanized; government agencies have estimated the average capital investment per farm at about $100,000. In the mid-1970's there were about 28,500,000 acres of improved farmland in the province, of which 18,100,000 were under cultivation. Most of the rest was improved pasture or summer fallow. Alberta has about 3,900,000 beef cattle, roughly 32 percent of the total for Canada. It also produces about 52 percent of Canada's barley (245,000,000 bu.), 33 percent of the oats (106,000,000 bu.), and 22 percent of the wheat (182,000,000 bu.).

Wheat is the predominant crop in the dry-land area in the S.E. part of the province. The most extensive wheat-growing regions, comprising some 4,000,000 acres, are found in the semicircular band that surrounds the dry-land area. Where the land is unsuitable for cultivation, cattle and sheep are raised on ranges where grasses, although scarce, have a high nutritive value. In the S. portions wheat growing or cattle ranching is carried on as a specialty. The narrow area that begins in the S., stretches through the center of the province, and widens around Edmonton is classed as the most productive and is the region of considerable mixed farming with emphasis on dairying and swine production. Although wheat is grown to a considerable extent N. of Edmonton, the land is best suited to the production of coarse grains and, with mineral fertilizers added, legumes. More than 1,000,000 acres of dry lands in S. and east central Alberta are considered to be ultimately irrigable.

Fishing. Commercial fishing in Alberta takes place during the winter. In the mid-1970's the annual value of the catch was about $975,000. Whitefish and tullibee represent about 53 percent and 30 percent, respectively, of the total catch. The latter is used mainly by fur farms as animal food. Perch, pickerel, and pike are taken commercially in small quantities.

Mining. Alberta is by far Canada's leading province in the production of mineral fuels. The value of crude oil, natural gas, and natural gas by-products in the mid-1970's was $5.64 billion, about 89.8 percent of the total for the country at large.

The first major oil discovery in the province was made at Turner Valley in the 1920's; the next important field, Leduc, was opened up in 1947. Since that time numerous other discoveries have been made, including the world's largest known reserve of oil-bearing tar sands, known



Giant excavator, Great Canadian Oil Sands Plant, Alberta. The province is Canada's preeminent mineral producer, and the oil sands of the Athabasca River region make up one of the world's largest known petroleum deposits. Photo Services, Government of Alberta

as the Athabasca deposit, near Fort McMurray.

Oil production in the mid-1970's was about 446,400,000 bbl per day. The annual value of production was $3.25 billion. Production from the Athabasca sands deposits was about 50,000 bbl per day.

Alberta has vast reserves of natural gas. Gas is still used to a significant extent to fuel homes and industry within the province, but most of it is now exported to other provinces and to the U.S. through a system of pipelines built since the 1950's. Annual production of gas in the mid-1970's was 2.58 billion cu.ft., with a value of $1.6 billion.

Alberta is also Canada's leading producer of coal, accounting for about 39 percent of the country's output. Annual production in the mid-1970's was 10,500,000 tons, with a value of about $185,000,000. The most important mines are located in the Rocky Mt. foothills.

Virtually no metals are mined in the province, but Alberta does supply about 96 percent of Canada's elemental sulfur, a nonmetallic ore. Small deposits of gold, iron, lead, silver, and zinc are found, and there are extensive deposits of clay, gravel, and lime. Silica sands are found in the Peace R. region.

Forestry. Approximately 107,000 sq.mi., or about 42 percent, of Alberta is forested, more than 94,000 sq.mi., or about 37 percent, is productive forest land. The forests not only support an important lumber industry but are also of great value to individuals as fuel and building material. White spruce accounts for about 75 percent of the timber cut annually in Alberta.

Tourism. Main tourist attractions include Calgary, Edmonton, and the national parks Some 3,800,000 persons travel through Alberta each year, spending about $330,000,000.

Transportation. Alberta is served by several transcontinental airlines, interprovincial airlines, and a number of charter-flight companies that fly principally out of Edmonton into the arctic region. More than 185 land and 20 seaplane bases are located in the province, with good airfields near all of the major cities An international airport was opened in 1960 at a site about 15 miles s. of Edmonton. Several U.S. airlines have passenger privileges in Alberta.

In the years following World War II the province concentrated on a program of highway improvement, and by the mid-1970's Alberta had about 87,800 mi of highways and roads, of which about 6900 mi are paved highway.

The three major railroads operating in Alberta, with more than 6200 mi of track, are the Canadian National Railway, the Canadian Pacific Railway, and Northern Alberta Railways, which is owned jointly by the other two systems. The Great Slave Lake Railway links the province with the Northwest Territories.

Communications. There were 31 private radio stations in operation in the mid-1970's, including 1 French-language station in Edmonton. In addition 2 stations are operated by the Canadian Broadcasting Corporation and 2 others are owned by the provincial government. There were 7 private television stations and 2 Canadian Broadcasting Corporation stations, 1 of which operated in the French language. Direct telecasts from eastern Canada were received late in the 1950's by way of the trans-Canada microwave system. The domestic satellite communications system came into operation in 1973, supplementing the existing microwave systems; *see* CANADA: *Communications.*

Daily newspapers, with a combined circulation of more than 380,000, are published in Edmonton, Calgary, Grande Prairie, Lethbridge, Medicine Hat, and Red Deer. The province has about 105 weekly and semiweekly publications, chiefly newspapers.

GOVERNMENT

The government of Alberta comprises the lieutenant governor, the executive council, or cabinet, and the legislative assembly. The lieutenant governor is appointed by the Federal government as agent for the governor-general of Canada, who, in turn, is the representative of the British Crown in Canada. The head of the government is the premier. The premier, leader of the major political party in the legislature, selects the members of the executive council from among the members of his party in the assembly. The executive council is responsible to the legislature. The legislature is patterned after both the British and Canadian House of Commons, and derives authority from the British North America Act of 1867, as subsequently amended. One legislator is elected from each of the 75 electoral districts. Alberta has 19 elected members in the Canadian House of Commons and 6 appointed members in the Senate. The provincial judicial system includes the Alberta supreme court. All magistrates, judges, and justices are appointed officials.

Local Government. Municipal governments, which derive their power from provincial statutes, administer the cities, towns, villages, municipal districts, and counties. Each municipal unit has a council of elected officials, the number varying from district to district. Among the responsibilities of the municipal councils are public utilities and local health services.

Voting Qualifications. In provincial elections the franchise is extended to men and women eighteen years of age and over. Municipal councilors are elected by persons twenty-one years of age and over, and school boards are elected by property owners.

HISTORY

The area that is now Alberta was first explored by French and English fur traders about 1750. Settlement began with the establishment of trading posts in the 1780's and 1790's. From 1821 the region was controlled by the Hudson's Bay Company. In 1869 the new dominion of Canada bought the company's lands and organized them as the Northwest Territories. Soon the Canadian government sent in the North-West Mounted Police to keep order and concluded treaties with the Indians.

In 1882 the Territories was subdivided into administrative districts. The governor general of Canada named the new district of Alberta after his wife, Princess Louise Caroline Alberta, daughter of Queen Victoria. Alberta was linked to the rest of Canada by the Canadian Pacific Railway in 1883. Settlement, however, remained sparse until new Canadian prosperity after 1896 spurred European and U.S. immigration. Between 1901 and 1911 Alberta's population rose from 73,000 to 374,295. The immigrants turned to farming, especially wheat. As the population grew, the Federal government extended the boundaries of the district east and north and on Sept. 1, 1905, made it a province.

Alberta was at first overwhelmingly agricultural. In the south, ranching predominated; farther north, the principal crop was wheat. The province thus closely resembled the Prairie States of the U.S. in farming technology and population. Raising, marketing, and transporting agricultural products dominated both provincial and Federal politics under a Liberal administration. But Albertans began to distrust the urban east and the established Liberal and Conservative parties. In 1921 Alberta elected a farmers' government drawn entirely from the United Farmers Party of Alberta. The Great Depression after 1929 hit the province hard: wheat prices collapsed, and much of the population found itself on relief. In 1935 Alberta turned to the new Social Credit Party, headed by the charismatic radio evangelist William Aberhart. His party, radical in monetary theory, turned out to be conservative in practice largely because of constitutional limitations on its actions.

World War II was an economic turning point. War industries were attracted to Edmonton and Calgary, near which oil had been found In 1947 a new oil discovery at Leduc made the province a major oil and gas producer The Social Credit Party, led by Premier E. C. Manning, occupied itself with transporting oil and natural gas to markets in the east. In 1958 a gas pipeline to eastern Canada was completed. As industries boomed, the character of the province changed. The farm population fell from 51 percent in 1931 to only 21 percent in 1961 Average income soared, particularly after world oil prices increased in 1973. In 1968 Manning retired, to be succeeded by Harry Strom, under whose cautious leadership the party increasingly lost touch with the electorate In 1971 the Conservatives for the first time formed Alberta's government, under Peter Lougheed. His "Alberta-first" policies, stressing industrial development, sometimes led to confrontations with the Federal government. R.Bw.

ALBERT EDWARD NYANZA. *See* EDWARD, LAKE

ALBERTI, Leon Battista (1404–72), Italian architect and writer, born in Venice. He received the best education available in the 15th century, first at the school of Barsizia at Padua, and then at the University of Bologna. He became proficient in the Greek language as well as in mathematics and the natural sciences. As a poet, a philosopher, and one of the first organists of his day, Alberti greatly influenced his contemporaries. In 1432 he was appointed a papal secretary by Pope Eugenius IV (*see under* EUGENIUS). Alberti's architectural training began with the study of antique monuments during his first stay in Rome, from 1432 to 1434. Subsequently he joined the papal court in Florence, where he became intensely involved with the artistic life of the city. Among his friends and associates were the great architect Filippo Brunelleschi and the renowned sculptor Donatello (qq.v.). Probably at this time he discovered the mathematical laws of linear perspective (q.v.), which were of inestimable value to the painters of his own and succeeding generations. Alberti took an active part in the literary life of Florence, and championed the use of the native tongue instead of Latin. After spending nine years in Florence and other parts of Italy, he returned to Rome. He was secretary to six popes. Under Pope Nicholas V (*see under* NICHOLAS), he was in charge of the projects for rebuilding Saint Peter's Basilica and the Vatican.

Although his buildings rank among the best architecture of the Renaissance, Alberti was a theoretical rather than a practical architect He furnished the plans of his buildings but never supervised their construction His art is the most strictly classical of the early Renaissance and prepared the way for the architectural style of Bramante (q.v.) and other architects of the High Renaissance. The purity of Alberti's art is evident in the façade of the church of San Francesco at Rimini, adapted from the arch of Augustus at Rimini. Alberti had a number of pupils and associates, who carried out his plans for the facade of Santa Maria Novella and the Rucellai Palace (1446–51), both in Florence, and other famous buildings. His *De Re Ædificatoria* ("Concerning Architecture", 1485) was the first printed work on architecture of the Renaissance. He also wrote manuals on architecture, statuary, and painting; his treatises on painting were the most important for the study of that form of art before Leonardo da Vinci (q v)

ALBERTI, Rafael (1903–), Spanish poet, born in Puerto de Santa María, and educated at the local Jesuit academy. He studied painting in Madrid from 1918 to 1924 when he turned to the writing of poetry. His first volume, childhood recollections of the sea entitled *Marinero en Tierra* (1924; Eng. Trans., "A Sailor on Land"), won the Spanish National Prize for Literature in 1925. Subsequently he traveled in France, Germany, and the Soviet Union. Meanwhile he wrote poetry characterized by an inventive treatment of folk themes as in the collections *La Amante* (1926; Eng. trans., "The Lover") and *El Alba del Alhelí* (1927; Eng. trans., "The Dawn of the Gillyflower"). In *Cal y Canto* (1929; Eng trans., "Lime and Stone") he utilizes complex baroque verse forms in expressing his view of 20th-century civilization. His masterpiece, *Sobre los Ángeles* (1929; Eng. trans., "Above the Angels"), is a surrealistic allegory in which angels represent various forces in the real world.

Alberti supported leftist causes in the early 1930's, and during the Spanish Civil War he served with the Loyalist air force; *see* SPAIN. After the war he emigrated to Argentina. His subsequent writings in general have been considered inferior to his earlier work. He received the Lenin Peace Prize in 1965.

ALBERTITE. *See* ASPHALT

ALBERT, LAKE, *or* ALBERT NYANZA, lake of Uganda, in East-central Africa. Lake Albert is elliptical in shape, about 100 mi. long, and about 22 mi. at the widest part, with no depth exceeding 55 ft.; the area is about 2065 sq mi. The surface of the lake is about 2000 ft. above sea level and is estimated to have been about 3000 ft above sea level in recent geological times. One of the sources of the Nile R., Lake Albert receives the waters of Lake Victoria to the SE and Lake Edward to the SW before flowing into the Nile. Lake Albert was discovered in 1864 by the British explorer Sir Samuel Baker, who named it in honor of Albert, Prince Consort of Great Britain (qq.v.). Since 1894 it has formed part of the boundary line between Uganda and the Republic of Zaire (former Democratic Republic of the Congo).

ALBERT LEA, city in Minnesota, and county seat of Freeborn Co., near Albert Lea and Fountain lakes, about 100 miles S of Saint Paul. It is the retail and wholesale center of an important grain, livestock, vegetable, and dairy region. Industries in Albert Lea include meat and poultry packing, the processing of dairy products, and the manufacture of furniture. Settled in the 1850's, Albert Lea was incorporated as a city in 1878. Pop. (1960) 17,108; (1970) 19,418.

ALBERT NYANZA. *See* ALBERT, LAKE.

ALBERTUS MAGNUS, Saint, called ALBERT THE GREAT (1206–80), German scholastic theologian and scholar, born in Lauingen. He entered the Dominican order in 1223, taught in Cologne and Paris, served as bishop of Ratisbon (now Regensburg, in West Germany) from 1260 to 1262, and continued active thereafter as an influential teacher, ecclesiastical administrator, and preacher. His most noted pupil was the Italian scholastic philosopher Thomas Aquinas (*see* AQUINAS, SAINT THOMAS). Albert's immense scholarly labors made it possible for the medieval Christian world to know Greek and Arabian science and philosophy. He is especially known for his attempts to reconcile Christian theology with the teachings of the ancient Greek philosopher Aristotle (q.v.). In addition, he engaged in biological research and reported at length his observations and speculations in various other scientific fields. His chief works are *Summa de Creaturis* ("Treatise about Mankind"), which deals mainly with man and his immortal soul, and *Summa Theologiae* ("Treatise on Theology"), an unfinished account of God as the cause and goal of all creatures. Pope Pius XI (*see under* PIUS) declared him a Saint and a doctor of the Church in 1932; his feast is Nov. 15. *See* SCHOLASTICISM.

ALBIGENSES, members of a religious sect that was active during the 12th and 13th centuries primarily in the regions surrounding Albi and Toulouse in southern France. Their doctrines are known only from the accounts of their opponents and persecutors, who called them Cathari (q.v.) because they, like the Cathari, opposed secular authority. They were also called puritans and were represented as Manichaeans (*see* MANICHAEISM). The Albigenses practiced a dualistic religion based on a belief in two equal gods, one of good and one of evil. They denounced the corruption of the clergy of their day, refused to recognize the religious practices of the Church, and opposed papal supremacy. In effect, they organized a rival church with its own clergy and sacraments.

The provinces (*see* TOULOUSE, COUNTS OF) in which they were most numerous were rich, peaceful, and prosperous, and the rulers, particularly Raymond VI of Toulouse (1156–1222) extended to them so much favor that it was difficult for the Church authorities to deal with them effectively, until Pope Innocent III (*see* INNOCENT, *Innocent III*) in 1208 proclaimed a crusade against them as heretics. Zealots of all lands took part in the Albigensian Crusade, which was principally an invasion of the south of France by the northern nobles, unofficially supported by Philip II (q.v.), King of France. Led by the French soldier Simon IV de Montfort l'Amaury (1160?–1218), the crusaders began operations against the Albigenses by seizing and sacking the towns of Béziers and Carcassonne. They treated the inhabitants savagely, massacring a large number of persons in Béziers alone. Much of southern France was devastated in the subsequent fighting.

Peace was finally restored in 1229. Under the terms of an agreement signed in Paris, Raymond VII of Toulouse (d. 1249) withdrew his support from the Albigenses and surrendered a considerable portion of his lands to Louis IX (q.v.) of France. The Albigenses were then treated with relentless severity by the Inquisition (q.v.), and by the end of the 14th century the sect had disappeared. *See also* WALDENSES. S.R.Pa.

ALBINO, individual with hereditary deficiency of the normal pigmentation of its species. The pigment melanin, primary cause of normal human coloration, is absent in the tissues of human albinos because the enzyme tyrosinase, required for its formation, is lacking. As a result, albinos have pale skin, white or light yellow hair, and eyes which, although actually colorless, appear pink because the blood vessels of the retina are visible. Lacking the protection that pigment affords against strong light, albinos are photophobic (shunning light) and, in ordinary illumination are inclined to squint. Absence of melanin in certain brain tissues is probably the cause of the nystagmus (oscillation of the eyeballs), characteristic of most albinos.

Animal albinism is caused by a lack of the pigment melanin. Such animals, weakened and easily sighted by enemies, rarely survive in their natural habitat. UPI

Albinos occur in all races of humans, most frequently among certain Indian tribes of the southwestern United States, but nowhere in large numbers. Albinism is transmitted as a recessive characteristic Several types of partial albinism exist, including dominant piebald albinism, dominant white forelock, and chromosomal sex-linked ocular albinism. *See* HEREDITY: *Dominance; Linkage;* MENDEL'S LAW.

Animal albinism, similar to that of humans in its cause, effects, and transmission, has been observed in most species of domestic animals and in a wide variety of other mammals and birds. The white rabbits, white rats, and white mice common in biological laboratories are true albinos. Forms of albinism occur in cold-blooded animals, but their causes are different. Albinism in frogs and certain salamanders, for example, is apparently caused by hormonal deficiency, because it can be cured by an injection of pituitary hormone. In fish, complete or spotty melanism (atypical black color) or albinism can be induced by merely severing certain nerves. Most cases of so-called albinism in insects are probably color variations rather than the complete absence of pigmentation characteristic of albino mammals. Albinism in plants is always quickly fatal, because the plant cannot manufacture its food without the pigment chlorophyll (q.v.). *See also* PIGMENT. N.E.M.

ALBOIN (d 573), founder of the kingdom of Lombardy in Italy He became chief of the Lombards (q v.) in 565, when the tribe lived in the region between the Danube R and the head of the Adriatic Sea Three years later, with the assistance of the Avars (q v.), Alboin defeated the Germanic people known as the Gepidae After marrying the Gepidae princess, Alboin led the Lombards and a large number of Saxons across the Alps into northern Italy and established a kingdom in the valley of the Po R , with Pavia as its capital.

ALBRIGHT, William Foxwell (1891-1971), American archeologist and educator noted for his work in the Middle East

Born of missionary parents May 24, 1891, in Coquimbo, Chile, Albright studied at Upper Iowa University and earned his PH D in archeology and linguistics at Johns Hopkins University in 1916. He became director of the American School of Oriental Research in Jerusalem in 1921. In 1929 he was made professor of Semitic languages at Johns Hopkins, a post he held until he acquired emeritus status in 1958 Albright was one of the leading Biblical archeologists of his time, heading numerous expeditions in Palestine, southern Arabia, and adjacent regions An expert in reconstructing past civilizations from their artifacts, he gained a wide reputation for his identification of "lost" Bible towns and his use of potsherds to date archeological finds His more than 800 publications included *From the Stone Age to Christianity* (1940) and *Yahweh and the Gods of Canaan* (1968). Albright died Sept. 19, 1971, in Baltimore, Md.

ALBUMIN, one of a class of simple proteins (*see* PROTEIN), composed of carbon, hydrogen, oxygen, nitrogen, and a small percentage of sulfur. Albumin is coagulable by heat, mineral acids, alcohol, and ether and is soluble in water and in a weak salt solution An important article of diet, albumin is present in such animal tissues as egg white, milk, and muscle, and is found in blood plasma (*see* BLOOD: *Composition of Blood· Plasma*); it occurs also in plants, especially in seeds. During World War II pure human-blood-serum albumin was prepared in large quantities for use in transfusions (*see* BLOOD· *Blood Transfusion: Transfusion of Plasma*). Because albumin coagulates when heated to 160° F. (71° C.), it is useful for removing cloudy precipitates, thus clarifying solutions in sugar refining and other processes. With many metallic salts, such as bichloride of mercury, sulfate of copper, and nitrate of silver, albumin forms insoluble compounds or albuminates, and is therefore used as an antidote to these poisons.

A paste made by mixing albumin with slaked lime sets to a mass of stony hardness and is used as cement for broken earthenware.

ALBUQUERQUE, largest city in New Mexico, and county seat of Bernalillo Co., on the Rio Grande R. near the geographical center of the State, 62 miles S.W. of Santa Fe. Railroad shops, an oil refinery, packing and canning plants, and brickworks are among the principal industrial establishments. The city is a popular health and vacation resort. It is the site of the University of New Mexico (1889, coeducational), which in the mid-1960's had an enrollment of about 12,000 students and a faculty of about 675. Albuquerque was founded in 1706 and named for Francisco Fernández de la Cueva Henríquez, Duque de Albuquerque, viceroy (1702–11) of New Spain. Much of the old town remains, including the church of San Felipe de Neri. Construction of the new section of the city began in 1879. Albuquerque was incorporated as a city in 1890. Pop. (1960) 201,189; (1970) 243,751.

ALBUQUERQUE, Affonso de, *called* AFFONSO O GRANDE *or* AFFONSO THE GREAT (1453–1515), Portuguese navigator and statesman, and founder of the Portuguese empire in the Orient, born in Alhandra, near Lisbon. He spent his youth at the court of Alfonso V (q.v.), King of Portugal, and later took part in the expedition against the Turks that culminated in a Christian victory of Otranto, Italy, in 1481. In 1503 he made his first trip to the East, traveling with a Portuguese fleet around the Cape of Good Hope to India. Three years later Emanuel (q.v.), King of Portugal, appointed him viceroy of all Portuguese possessions in Asia. His predecessor, the Portuguese colonial governor Francisco de Almeida (q.v.), refused to give up his office, and imprisoned Albuquerque from 1508 to 1509. The new viceroy was eventually released to assume office when a fleet arrived from Portugal to free him. As viceroy, Albuquerque captured the district of Goa, India, in 1510, and completed the conquest of Malabar, Ceylon, the Sunda Islands, the peninsula of Malacca, and the island of Hormuz at the entrance to the Persian Gulf. He maintained strict military discipline in the territories under his control, but was respected and beloved by his subjects.

In spite of his valuable services, Albuquerque was the victim of intrigue at the Portuguese court. In 1515 King Emanuel, who had become suspicious of the viceroy, appointed one of Albuquerque's personal enemies as his successor. Although he was offered assistance to help him resist Emanuel's arbitrary decree, Albuquerque would not violate his allegiance. A few days after receiving notice that he had been superseded, he died at sea near Goa, on the Malabar coast. A biography of him containing his collected papers was written by his son Braz Albuquerque (1500–80) in 1557.

ALCAEUS (fl. about 600 B.C.), Greek poet, born in Mytilene (now Mitilini) on the island of Lesbos (now Lésvos). Alcaeus became a leader against the Lesbian tyrant Pittacus (650?–570 B.C.) and was banished from Lesbos. He lived for a time in Egypt and Thrace, but was pardoned by Pittacus, whereupon he seems to have returned to Mytilene. Little is known about his later life. Of the ten books of his odes, only a few poems in fragmentary form are extant, these, all composed in the Aeolic dialect, are for the most part concerned with his grief over the state of Lesbos, his hatred of tyrants, and his own misfortunes; in some of the poems he praises love and wine. Alcaeus was the inventor of the Alcaic stanza, which the Roman poet Horace (q.v.) subsequently adapted to Latin lyric poetry.

ALCAHEST. *See* ALCHEMY.

ALCALÁ DE HENARES, town of Spain, in Madrid Province, on the Henares R., about 20 miles E. of Madrid. It is an industrial center producing leather products and soap and is a trading center for the surrounding agricultural area. The town was known to the Romans as Complutum. It was destroyed around 1000 and was rebuilt in 1083 by the Moors. The University of Alcalá, which became a leading educational center in Spain, was founded in 1510; it was moved to Madrid in 1836. A celebrated early Bible, the Complutensian Polyglot Bible, was printed in Alcalá in 1517. The town is the birthplace of the Spanish writer Miguel de Cervantes Saavedra (*see* CERVANTES SAAVEDRA, MIGUEL DE). Pop. (1970) 59,783.

ALCALÁ ZAMORA Y TORRES, Niceto. *See* SPAIN: *History: The Republic*.

ALCAN HIGHWAY. *See* ALASKA HIGHWAY.

ALCATRAZ, island in San Francisco Bay, California, about 4 miles N. of the city of San Francisco. It rises 130 ft. above the surface of the bay and is about ⅓ mi. long. The Spanish discovered the island in 1769. From 1868 to 1933, when the Army transferred it to the Department of Justice, it served as a military prison. The island then served as a Federal prison for dangerous prisoners until 1963 when it was abandoned.

ALCESTIS, in Greek mythology, daughter of Pelias (q.v.), King of Iolcus in Thessaly. She married Admetus, King of Pharae and friend of the god Apollo (q.v.). When it was time for Admetus to die Apollo persuaded the Fates (q.v.) to let him live if he could persuade another to die in his place Alcestis willingly took poison to spare Admetus' life Later the hero Hercules rescued her from Hades (qq v) and returned her to life

ALCHEMILLA. *See* LADY'S MANTLE

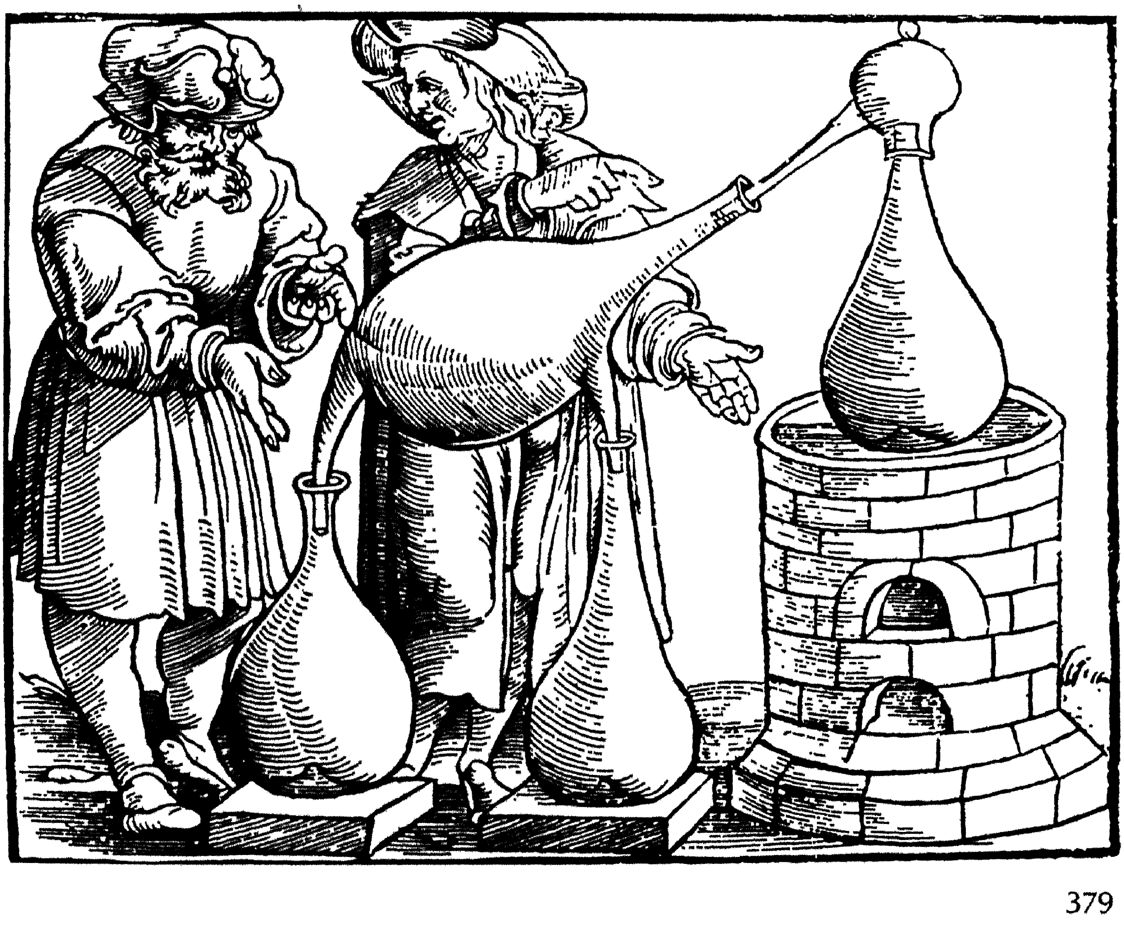
ALCHEMY, ancient art practiced especially in the Middle Ages, devoted chiefly to discovering a substance that would transmute the more common metals into gold or silver, and to finding a means of indefinitely prolonging human life Although its purposes and its techniques were dubious and often illusory, alchemy was in many ways the predecessor of modern science, especially the science of chemistry.

The birthplace of alchemy was ancient Egypt, where, in Alexandria, it began to flourish in the Hellenistic period; simultaneously, a school of alchemy was developing in China. The writings of some of the early Greek philosophers might be considered to contain the first chemical theories, and the theory advanced in the 5th century B.C. by Empedocles (q.v), that all things are composed of air, earth, fire, and water, was influential in alchemy. The Roman emperor Caligula (q.v) is said to have instituted experiments for producing gold from orpiment, a sulfide of arsenic, and the emperor Diocletian (q v) is said to have ordered all Egyptian works concerning the chemistry of gold and silver to be burned in order to stop such experiments. Zosimus the Theban (about 250–300 A D) discovered that sulfuric acid is a solvent of metals, and he liberated oxygen from the red oxide of mercury.

The fundamental concept of alchemy stemmed from the Aristotelian doctrine that all things tend to reach perfection Since other metals were thought to be less "perfect" than gold, it was reasonable to assume that nature formed gold out of other metals deep within the earth, and that with sufficient skill and diligence an artisan could duplicate this process in his workshop Efforts toward this goal were empirical and practical at first, but by the 4th century A D, astrological and magical theory and ritual had begun to gain prominence.

A school of pharmacy flourished in Arabia during the caliphates of the Abbasids from 750 to 1258; *see* CALIPH. The earliest known work of this school is the *Summa Perfectionis,* or "Sum-

Two alchemists are portrayed in this woodcut from the earliest records on chemistry, Summa Perfectionis



mit of Perfection", written in the 8th century by the Arabian scientist Geber (Jābir ibn-Hayyān, fl. 721–76); the work is consequently the oldest book on chemistry proper in the world, and is a collection of all that was then known and believed. The Arabian alchemists worked with gold and mercury, arsenic and sulfur, and salts and acids, and became familiar with a wide range of what are now called chemical reagents. They believed that metals are compound bodies, made up of mercury and sulfur in different proportions. Their scientific creed was the potentiality of transmutation, and their methods were mostly blind gropings; yet, in this way, they found many new substances, and invented many useful processes. To the Arab alchemists we owe the terms alcohol, alkali, borax, and elixir.

From the Arabs, alchemy found its way through Spain into Europe generally. In the Middle Ages it was chiefly the monks who occupied themselves with alchemy. The earliest authentic works extant on European alchemy are those of the English monk Roger Bacon and the German philosopher Saint Albertus Magnus (qq.v.); both believed in the possibility of transmuting inferior metals into gold. This idea excited the imagination, and later the avarice, of many persons during the Middle Ages. They believed gold to be the perfect metal, and that baser metals were removed by various degrees of imperfection from gold. Thus they sought to fabricate or discover a substance, the so-called Philosopher's stone, so much more perfect than gold that it could bring the baser metals up to the perfection of gold.

Roger Bacon believed potable gold (gold dissolved in aqua regia) to be the elixir of life. Albertus Magnus had a great mastery of the practical chemistry of his time. The Italian Scholastic philosopher Saint Thomas Aquinas, the Catalan churchman Raymond Lully (qq.v.), and the supposed Benedictine monk Basil Valentine (fl. 15th cent.) also did much to further the progress of chemistry, although along alchemical lines, in discovering the uses of antimony, the manufacture of amalgams, and the isolation of spirits of wine, or ethyl alcohol.

Important compilations of recipes and techniques in this period included *De la Pirotechnia* ("The Pirotechnia", 1540) by the Italian metallurgist Vannoccio Biringuccio; *de re Metallica* ("Concerning Metals", 1530) by the German mineralogist Georgius Agricola (q.v.); and *Alchemia* (1597) by Andreas Libau (d. 1616), a German naturalist and chemist.

Most famous of all was the 16th-century Swiss alchemist *Philippus Paracelsus* (q.v.). Paracelsus held that the elements of compound bodies were salt, sulfur, and mercury, representing respectively earth, air, and water; fire he regarded as imponderable, or nonmaterial. He believed, however, in the existence of one undiscovered element common to all, of which the four elements of the ancients were merely derivative forms. This prime element of creation Paracelsus termed alkahest, and he maintained that if it were found, it would prove to be the philosopher's stone, the universal medicine, and the irresistible solvent.

After Paracelsus, the alchemists of Europe became divided into two groups. One group was composed of men who earnestly devoted themselves to the scientific discovery of new compounds and reactions, and who were the legitimate ancestors of modern chemistry as ushered in by the work of the French chemist Anton Laurent Lavoisier (q.v.), see CHEMISTRY: *History*. The other group took up the visionary, metaphysical side of the older alchemy and developed it into a practice based on imposture, necromancy, and fraud, from which the prevailing notion of alchemy is derived. S.Z.L.

ALCIBIADES (about 450–404 BC), Greek statesman and general, born in Athens. After the death of his father in 447 BC, he was raised in the house of his uncle, the Greek statesman Pericles (q.v.). Alcibiades was influenced by the Greek philosopher Socrates (q.v.), who was his personal friend. Alcibiades gained great wealth through his marriage, but he squandered his money and led a dissipated life. By expensive public displays, especially at the Olympian Games (q.v.) of 420 BC, he won the favor of the common people. His only political rival was the Athenian statesman Nicias (d. 413 BC) who had secured a treaty of peace for fifty years between the Athenians and the Spartans. In 415 BC Alcibiades made himself head of the army and induced the Athenians to undertake an expedition against Syracuse, for which he was elected one of the commanders. Before the departure of the expedition, all the statues of the god Hermes (q.v.) in Athens were mutilated in a single night; the blame for the sacrilege was laid upon Alcibiades, who was charged with impiety and recalled from the expedition. On his return he landed at Thurii and fled to Sparta, where he divulged the plans of the enterprise and helped the allied Spartans and Syracusans to defeat the Athenians. For this act of treason, a sentence of death was recorded against him at Athens and his property was confiscated.

In 414 BC Alcibiades went with the Spartan

An ancient bust of the Greek statesman and general Alcibiades
Bettmann Archive

expedition to the island of Khíos (q.v.), where he incited an Ionian revolt (*see* IONIANS) against the Athenians. Difficulties with the Spartan leaders led to a plot to assassinate Alcibiades On learning of the plot, Alcibiades fled to the Persian provincial governor Tissaphernes (fl. 3rd cent. B C) and attempted without success to win him over to the Athenians on the ground that it was in the interest of Persia to prevent Sparta from gaining complete ascendancy over Athens. Alcibiades then offered to bring Persian support to the Athenians if they would revoke the decree making him an exile. His offer was accepted, but he wished to render some service to Athens before returning. He therefore remained abroad and won important victories for the Athenians, including the capture of the cities of Cyzicus, Chalcedon, and Byzantium. Alcibiades returned to Athens in 407 B C and was received with general enthusiasm. He was again sent to Asia with a hundred ships, but the expedition was defeated at Notium in 406 B.C. As a result his enemies brought a new accusation against him, and he was relieved of his command. He thereupon again joined the Persians, taking refuge in Phrygia. At the request of the Athenian government, and with the approval of the Spartans, Alcibiades' residence was set on fire during the night, and, as he fled, he was killed by a volley of arrows. *See* OSTRACISM.

ALCINDOR, Lew. *See* JABBAR, KAREEM ABDUL

ALCIPHRON, (fl. about 180), Greek rhetorician, best known as the author of 118 extant epistles, written in correct and elegant Attic speech (*see* GREEK LANGUAGE: *Ancient Greek*) The letters are ostensibly written by fishermen, peasants, courtesans, beggars, and other commoners of Athens in the 4th century B C, they are valuable for their character sketches and for their representation of Athenian morals, manners, and customs of the period Some of the epistles of the courtesans are believed to be based upon lost comedies of the Greek playwright Menander (q v) and have been used to recreate the plots of the plays

ALCMAEON. *See* SEVEN AGAINST THEBES

ALCMAN (fl about 625 B C), Greek poet, born in Sardis, in Lydia. Alcman was one of the earliest of the famous lyric poets of Greece, and the first known to write choral lyrics in strophic form (*see* ODE) According to tradition, he was a slave who was freed and made a citizen of Sparta He wrote, in the Doric dialect, *Parthenia* (songs for choruses of virgins), bridal hymns, and verses in praise of love and wine. (*see* GREEK LANGUAGE. *Ancient Greek*) Only fragments of his poems are extant, the longest fragment is part of a song that was found on a papyrus in Egypt in 1855.

ALCMENE. *See* AMPHITRYON, HERCULES

ALCOCK, Sir John William (1892–1919), British aviator, born in Manchester, England His career in aviation began when he obtained an aviator's certificate in 1912. During World War I he served as an officer with the Royal Naval Air Force and in 1917 took part in the bombing of Constantinople (now Istanbul), Turkey. In June, 1919, he and Lieutenant Arthur Whitten Brown (1886–1948), another British aviator, made the first nonstop flight across the Atlantic Ocean, flying from Saint John's, Newfoundland, to Clifden, Ireland, in 16 hr. and 12 min. Alcock was killed six months later in an airplane crash in France

ALCOFORADO, Marianna (1640–1723), Portuguese nun and writer, born in Beja. She had been a nun in the Franciscan convent of the Conception in Beja for nine years when, in 1665, she met and formed a romantic attachment to Noël Bouton, later the Marquis de Chamilly (1636–1715), a French official on duty near Beja. As a result of the scandal that developed when their relationship was discovered, Bouton deserted her and returned to France. Her five letters to him, written during the next two years and published anonymously in France as *Lettres Portugaises* (1669; Eng trans , *The Letters of a Portuguese Nun,* 1678), are among the most beautiful and touching ever written. The despair and anguish of the nun are exposed with unflinching honesty and perceptive self-analysis. Some critics have cast doubt on the authenticity of the letters, chiefly because the Portuguese originals have never been found Other critics, however, accept them as genuine on the basis of strong historical evidence of the romance between Marianna and Bouton.

ALCOHOL (Ar *al-kuhul*) term applied to members of a group of chemical compounds, and, in popular usage, to the specific compound ethyl alcohol The Arabic word denoted kohl, a very fine powder of antimony that Egyptian and Arabian women used as an eye makeup. The word alcohol originally denoted any fine powder, the alchemists of medieval Europe later used the word for essences (ultimate, purified substances) obtained by distillation, and this led to the current usage

Alcohols are a class of organic compounds containing the hydroxyl group, OH, attached to a carbon atom If this same carbon atom is also attached to two other hydrogen atoms, the alcohol is a primary alcohol, if it is attached to only one other hydrogen atom, a secondary alcohol; and if the carbon atom is attached to no other hydrogen atom, a tertiary alcohol. Ordinary ethyl alcohol is a primary alcohol Alcohols, although analogous to inorganic bases, are neither acid nor alkaline and are neutral to test papers. Alcohols are characterized by many common reactions, the most important of which is the reaction with acids to form substances called esters (q.v.), analogous to inorganic salts

Alcohol is a normal by-product in assimilation and digestion; it is found in the tissues and fluids of the human body and in plants.

Wood Alcohol. Methyl alcohol, or methanol, CH_3OH, is the simplest of all the alcohols; it has m.p. −144° F. (−97.8° C.) and b.p. 148.9° F. (64.96° C.) It was formerly made by the destructive distillation of wood; however, almost 90 percent of the methanol produced at present is synthetic, made from hydrogen and carbon monoxide Methyl alcohol is used as a denaturant for alcohol, as an antifreeze, as a solvent for gums and lacquers, and in the synthesis of many organic compounds, particularly formaldehyde (q.v.). When taken internally, by either drinking the liquid or inhaling the vapors, methyl alcohol is a violent poison (q.v.).

Ethyl Alcohol. Ethyl alcohol, C_2H_5OH, is known also as grain alcohol, ethanol, and methyl carbinol. It has sp.gr. at 60° F. (15.5° C.) of 0.794, b.p. 173 3° F. (78.5° C.), and m.p. about −179° F. (−117.3° C.). Ethyl alcohol is a limpid, colorless liquid, of burning taste, and characteristic, agreeable odor. Because of its low freezing point, it has been used as the fluid in thermometers for temperatures below −40° C., the freezing point of mercury, and for other special, low-temperature purposes, such as for antifreeze in automobile radiators. Boiling points of solutions of alcohol in water containing more than 85 percent alcohol are lower than that of pure alcohol. The lowest boiling point (78.174° C.) is obtained with a mixture containing 95.57 percent alcohol by weight (97.2 percent by volume) Alcohol is normally concentrated by distillation of dilute solutions, but the concentration cannot proceed beyond 97.2 percent by volume Commercial alcohol contains 95 percent by volume of alcohol and 5 percent of water Dehydrating agents are used to remove the remaining water and produce absolute alcohol.

Ethyl alcohol has been made since prehistoric times by the fermentation of sugars. All beverage alcohol and more than half of industrial alcohol is still made by this process. Starch from potatoes, corn, or other cereals can be the raw material; see FERMENTATION The yeast enzyme, zymase, changes the simple sugars into alcohol and carbon dioxide $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$ The fermentation reaction, represented above by a simple equation, is actually very complex because, due to impure cultures of yeast, varying amounts of other substances are produced, including fusel oil, glycerin, and various organic acids The fermented liquid, containing from 7 percent to 12 percent alcohol, is concentrated to 95 percent by a series of distillations. In the production of beverages such as whiskey (q v) and brandy some of the impurities,which supply the flavor, are of great value Much nondrinking alcohol is now made synthetically, either from acetaldehyde made from acetylene, or from ethylene made from petroleum A small amount is also made from wood pulp

Ethyl alcohol can be oxidized to form first acetaldehyde and then acetic acid (q.v.). It can be dehydrated to form ether (q.v). Butadiene (q.v.), used in making synthetic rubber, is made from alcohol, as are chloroform (q.v.) and many other organic chemicals Alcohol is miscible in all proportions with water and with most organic solvents. It is an excellent solvent for many substances and for that reason is used in making such products as perfumes, lacquer, celluloid, and explosives Alcoholic solutions of nonvolatile substances are called tinctures; if the solute is volatile the solution is called a spirit.

Most industrial alcohol is denatured to prevent its use as a beverage. Completely denatured alcohol contains small amounts, 1 percent or 2 percent each, of several different unpleasant or poisonous substances The removal of all these substances would involve a series of treatments more expensive than the Federal excise tax on alcoholic beverages These denaturants render alcohol unfit for many industrial uses In such industries especially denatured alcohol is used under closer Federal supervision Many formulas for special types of denatured alcohol are approved by the United States government

Higher Alcohols. Higher alcohols, those of greater molecular weight than ethyl alcohol, have many specific and general uses. Isopropyl alcohol is used extensively as a rubbing alcohol; butyl alcohol is a base for perfumes and fixatives, and alcohols are important flavoring agents and perfumes. Polyhydric alcohols, those containing more than one —OH group, are also important, as, for example, the trihydric alcohol known as glycerin (q.v.).

See also INTOXICATION, ALCOHOLIC.

ALCOHOLIC BEVERAGES. *See* BEER, DISTILLED LIQUORS; WHISKEY, WINE

ALCOHOLICS ANONYMOUS, *or* A.A., fellowship founded in 1935, the purpose of which is "to help the sick alcoholic recover if he wishes". Regular meetings are held by about 22,000 Alcoholics Anonymous (A.A.) groups located in the United States and foreign countries. World membership in 1975 totaled 725,000. The only membership requirement is for the self-admitted alcoholic to express a sincere desire to stop drinking. Members follow the A.A. program, consisting of twelve steps of recovery based on principles of human conduct found in medicine, psychiatry, religion, and in their own experience. A.A. is entirely supported by voluntary contributions from its members. A board of trustees, the General Service Board of A.A., serves without compensation. The World Service Office is in New York City.

ALCOHOLISM, chronic and progressive disease thought to be of physiological, psychological, social, and genetic origins, characterized by an increasing dependence on or addiction to alcohol, and often leading in its late stages to brain damage or early death. It has long been known that the excessive consumption of alcohol produces severe toxic effects, with eventual damage to body tissues. Only in recent years, however, has medical science recognized alcoholism as a chronic illness that responds to physical and psychological therapy. The disease affects about 6 percent of all consumers of alcoholic beverages; such persons, finding in alcohol relief from their problems and tensions, gradually develop an uncontrollable need, or even a physiological craving, for alcohol. Among the early symptoms of alcoholism are an inordinate need for alcohol at specific times of the day, a phenomenon known as pattern drinking, and asocial drinking. In later stages morning drinking becomes a necessity, and the individual undergoes a physical, psychological, and social deterioration that damages his relationships with other people and reduces his capacity to earn a living. Other symptoms may include lack of interest in food and alternate periods of frantic drinking and total abstinence In the acute stages, the alcoholic suffers successive periods of total physical and mental exhaustion Serious, and often fatal, complications of alcoholic poisoning may result from the excessive consumption of alcohol. *See* DELIRIUM TREMENS; INTOXICATION, ALCOHOLIC

The modern treatment of alcoholism includes, particularly in the acute phase, intensive vitamin and nutritional therapy, the administration of sedatives and tranquilizers, drugs that counteract metabolic disturbances, and supportive psychotherapy (q.v.). Antabuse, a drug that produces a violent intolerance for alcohol, is widely used. Appropriate tranquilizers and sedatives are effective in the acute stage, as in cases of delirium tremens. During the later stages of treatment, individual or group psychotherapy may help to resolve basic personality conflicts.

Extensive research on alcoholism was first undertaken by the Laboratory of Applied Physiology at Yale University in the late 1930's, and subsequently by numerous other institutions throughout the country. Other significant efforts have been made by such national voluntary organizations as the National Council on Alcoholism, organized in 1944, and Alcoholics Anonymous (q.v.). These activities finally succeeded in establishing a new approach to alcoholism as a major public-health problem in the United States, afflicting nearly 9,000,000 people. By 1969 forty-eight States had instituted programs for the control and prevention of the disease. The U.S. has over 200 special outpatient clinics for diagnosis and treatment, and an increasing number of general hospitals now accept patients for short-term treatment of the acute phase of the disease. Hundreds of transitional residential facilities for extended care have been established. The principal arm of Federal involvement in the study of alcoholism is the National Institute on Alcohol Abuse and Alcoholism. It formulates and recommends national policies and goals for the prevention, control, and treatment of alcoholism, and develops programs to realize these goals The most immediate aim of the institute is to aid local communities in making available high quality treatment and rehabilitation services.

Public education through public meetings and seminars, and in the press, radio, and television helps to erase the stigma and increase understanding of alcoholism. Early recognition of the disease allows victims to seek treatment before irreversible mental and physical damage occurs, but fundamental to successful rehabilitation is an understanding and enlightened environment

THE NATIONAL COUNCIL ON ALCOHOLISM, INC

ALCOTT, name of two American writers who were father and daughter.

Amos Bronson Alcott (1799–1888), American educator and philosopher, born in Wolcott, Conn. He developed a method of teaching young children by means of conversation, and in 1828 established a school at Boston, Mass., in which this system was employed The school was criticized by the press and regarded by the general public as a revolutionary innovation. In 1836 Alcott closed the school and moved to Concord, Mass. Thereafter he became widely known as a lecturer. He was a prominent abolitionist and one of the leaders of the philosophic doctrine of Transcendentalism (q.v.). His writings include *Observations on the Principles and Methods of Infant Instruction* (1830), *Conversations with Children on the Gospels* (1837), *Concord Days* (1872), *Table-Talk* (1877), and *Sonnets and Canzonets* (1882)

Louisa May Alcott (from a daguerreotype, about 1860)

Bettmann Archive

Louisa May Alcott (1832–88), American writer, born in Germantown, Pa. She was raised in Boston, Mass., and was tutored by the American writers Ralph Waldo Emerson and Henry David Thoreau (qq v.) While serving as a nurse during the American Civil War she wrote letters to her family that were later published as *Hospital Sketches* (1863). Her most famous works, *Little Women* (1868), an autobiographical novel of her childhood, and one of the sequels, *Little Men* (1871), are considered classics for children. These works are characterized by a deep sense of family loyalty and intimacy Her other writings include *Flower Fables* (1854), *Moods* (1864), *An Old-Fashioned Girl* (1870), *Work* (1873), *Spinning-Wheel Stories* (1884), and *Jo's Boys* (1886).

ALCUIN *or* **ALBINUS** (735–804), English scholar and ecclesiastic, born in Yorkshire, and educated at the cathedral school of York He became the head of the school in 778. During a mission to Rome in 780, he became acquainted with Charlemagne (q.v.), King of the Franks and later Holy Roman Emperor. At the request of Charlemagne, Alcuin directed an educational program among the Franks from 781 to 790, thereby exercising an important and lasting influence upon the intellectual life of the Western world. In 794 at the council held at Frankfort he led the successful fight against adoptionism (q.v.), a heretical belief then dividing the Catholic Church. After a brief visit to his native country, he returned to France, where he was made abbot of Tours in 796. He wrote many letters, works on rhetoric, and poems. His letters are among the most valuable sources of information about the social life and humanistic learning of 8th-century France. The impetus given to humanistic studies by Alcuin and his successors led not only to a revival of learning, but also to the development of the Carolingian, or Caroline, minuscule, a script that influenced the handwriting of the Renaissance in Italy and, indirectly, the Roman letters of the early Italian typesetters, from which modern type is derived; *see* PALEOGRAPHY

ALCYONE, star of the third magnitude, brightest star of the Pleiades (q.v.), about 300 light years from the earth (*see* LIGHT YEAR). It was named for a nymph in Greek mythology. Alcyone was one of seven sisters who, fleeing from the amorous advances of the giant hunter Orion, called upon Zeus (qq.v.), the ruler of the gods, for protection, Zeus transformed them into doves, and, after their deaths, into stars

ALDANOV, M. A., pen name of MARK ALEKSANDROVICH LANDAU, also known as LANDAU-ALDANOV (1889–1957), Russian novelist, born in Kiev, and educated at the University of Kiev He left Russia in 1919 to live in Paris but fled when France was occupied by the Germans during World War II. After 1941 he lived in the United States. Aldanov is best known for his historical novels, particularly *The Thinker* (1923–27), a tetralogy about the French Revolution His other novels include *The Fifth Seal* (1939), *Before the Deluge* (1947), *The Escape* (1950), and *To Live as We Wish* (1952)

ALDEHYDES, class of organic compounds intermediate between primary alcohols and acids, marked by the univalent group —CHO *See* CHEMISTRY· *Major Divisions of Chemistry· Organic Chemistry· Classes of Organic Chemistry.*

ALDEN, John (1599?–1687), one of the Pilgrim Fathers (q v), born in Southampton, England. He came to America on the *Mayflower* (q v.) in 1620 and was a signer of the Mayflower Compact He was one of the founders of Plymouth (q.v), the first permanent English settlement in New England In 1623 Alden married Priscilla Mullens (1602?–85?), the daughter of another Pilgrim Father. In 1631, together with the Plymouth colonist Myles Standish (q v), he founded Duxbury, where he lived until his death. Alden was active in the affairs of Plymouth Colony, serving alternately as assistant to the governor and as deputy from Duxbury. He lived longer than any of the other signers of the Mayflower Compact.

Alden's fame rests chiefly on the romantic tale written by the American poet Henry Wadsworth Longfellow (q.v.), "The Courtship of Myles Standish" (1858). In the poem, Alden, deeply in love with Priscilla Mullens, supposedly proposes to her on behalf of his shy friend Standish, whereupon she inquires, "Why don't you speak for yourself, John?"

ALDER, any plant of the genus *Alnus* in the Birch family (Betulaceae). The alders are trees or shrubs, natives of cold and temperate climates. Because the wood resists decay under water it is used for bridge pilings. Dye was formerly obtained from the bark of many species. The black alder, *A. glutinosa,* is a native of Europe. It reaches a height of about 30 to 70 ft. Among the varieties of alder used for ornamental planting are the golden alder, with bright golden-yellow leaves, and the cut-leaved alder, with narrow, deeply incised leaves. The gray alder, *A. incana,* has acute leaves, downy underneath but not glutinous, and grows to a height of about 80 ft.

Leaves and fruit of the speckled alder, Alnus rugosa
U S Forest Service

ALDER, Kurt (1902–58), German chemist, educated at the University of Kiel. Under the guidance of the German chemist Otto Diels (q v), his chief instructor at Kiel, he specialized in diene synthesis (later known also as the Diels-Alder reaction), which is essentially the analysis and formation of plastics and other similarly complex organic compounds As early as 1928 he and Diels coauthored a paper on this process. In 1934 Alder was appointed professor of chemistry at the University of Kiel. He subsequently became professor of chemistry and chemical technology at the University of Cologne. In 1950 he and Diels were jointly awarded the Nobel Prize in chemistry for their work in diene synthesis.

ALDERNEY, most northerly of the Channel Islands (q.v.).

ALDHELM, Saint (640?–709), English churchman and scholar. He became abbot of Malmesbury about 673, and bishop of Sherborne in 705. Noted for his learning, Aldhelm wrote poetry in Anglo-Saxon His feast day is May 25.

ALDINGTON, Richard (1892–1962), British writer, born in Hampshire, England, and educated at Dover College and the University of London. He served in the British army from 1916 to 1918 during World War I, traveled extensively after the war, and took up residence in the United States in 1939. His first volume of verse, *Images Old and New* (1915), exemplifies his interest in the poetic movement known as imagism (q.v), which he helped to found. In later volumes, including *A Dream in the Luxembourg* (1930) and *The Crystal World* (1938), he projects the incongruities of modern life against a classical background. His *Complete Poems* appeared in 1949. Aldington is also the author of a number of novels, notably *Death of a Hero* (1929), which is concerned with the reactions of a young soldier to the horrors of World War I. Among his later writings are the biographies *Wellington* (1946); *D. H. Lawrence* (1950), *Lawrence of Arabia* (1955), a highly controversial study of the British adventurer and writer Thomas Edward Lawrence (q.v.); and *Portrait of a Rebel* (1957), which is about the life and works of the Scottish novelist Robert Louis Balfour Stevenson (q.v.). Aldington also is noted for his numerous translations from the Greek, Medieval Latin, Italian, and French.

ALDRICH, Nelson Wilmarth (1841–1915), American statesman, born in Foster, R.I. He served for three years (1879–82) in the United States House of Representatives, and then for thirty years in the United States Senate. Aldrich was a leader of the Republican Party. As a champion of the protective tariff, he was chiefly responsible for the drafting and passage of the Payne-Aldrich Tariff Act of 1909. *See* TARIFFS: UNITED STATES.

ALDRICH, Thomas Bailey (1836–1907), American writer and editor, born in Portsmouth, N.H., and educated there and in New Orleans, La. After writing a collection of verse, *The Bells* (1855), he joined the staff of the *Home Journal*. He served (1866–74) as editor of *Every Saturday* and subsequently (1881–90) as editor of the *Atlantic Monthly*. His most famous work, *Story of a Bad Boy* (1870), was based on his boyhood experiences in Portsmouth. His collection of short stories, *Marjory Daw and Other People* (1873), is written in a graceful style. Among his other works are the novels *Prudence Palfrey* (1874), *Queen of Sheba* (1877), and *Stillwater Tragedy* (1880), and his collected essays *An Old Town by the Sea* (1895) and *Ponkapog Papers* (1903).

ALDRIN, Edwin Eugene, Jr. (1930–), American astronaut, born in Glen Ridge, N.J. He received a B.S. degree from the United States Military Academy, West Point, in 1951. Aldrin, who is commonly known as Buzz, was commissioned in the United States Air Force and served as a combat jet pilot during the Korean War. In 1963 he received an Sc.D. degree from the Massachusetts Institute of Technology and became an air force representative at the Manned Spacecraft Center, Houston, Texas. Aldrin entered the astronaut-training program in 1964. During his first space flight in November, 1966, as copilot of the earth orbital rendezvous mission Gemini XII, Aldrin achieved a record 5½ hr. space walk. In July, 1969, Colonel Aldrin, as part of the Apollo XI lunar mission, became the second man to set foot on the moon. His companions on the mission were Air Force Lieutenant Colonel (later Colonel) Michael Collins and the civilian astronaut Neil A. Armstrong (qq.v.); the last-named served as mission commander. *See also* ASTRONAUTICS.

ALDROVANDI, Ulisse (1522–1605), Italian naturalist, born in Bologna. In 1550 he went to Rome, where he studied Roman antiquities and wrote a history of ancient statuary. He received a degree in medicine from the University of Bologna in 1553; he later held successively the chairs of botany and natural history at the university, and practiced medicine in the city of Bologna. In 1567 Aldrovandi founded a botanical garden and established a museum of natural history, both in Bologna. His most important writing is an elaborate *Natural History*. Of this work three volumes, on ornithology, were published in 1599 and a fourth, on entomology, was published in 1602. After his death his students and colleagues prepared ten additional volumes from his notes and drawings.

ALE, fermented cereal beverage brewed from an infusion of grain, chiefly malted barley, and flavored with hops. About 1524, before the introduction of hops from the Netherlands into England and Germany, ale referred to any fermented malt beverage. After 1524 the term was applied to all hop flavored brews, but has since gradually come to indicate only those produced by the top fermentation process. *See* BEER; BREWING.

ALEANDRO, Girolamo, *or* HIERONYMUS ALEANDER (1480–1542), Italian cardinal, born near Venice. As the papal representative at the Diet of Worms, held at Worms, Germany, in 1521, he led the opposition to Martin Luther (q.v.), German religious reformer accused of heresy. Aleandro wrote the edict against Luther that was adopted by the Diet and approved by Charles V (q.v.), Holy Roman Emperor. Pope Paul III (*see under* PAUL) made him a cardinal in 1536. Aleandro compiled a lexicon of Greek and Latin.

ALEICHEM, Shalom. *See* SHALOM ALEICHEM.

ALEKHINE, Alexander (1892–1946), Russian chess grand master and world champion, born in Moscow, and educated at the universities of Petrograd (now Leningrad) and Paris. During World War I he served in the Russian Red Cross, but after the Russian Revolution of 1917 he emigrated to France and became a French citizen. He won the rank of chess master at the age of sixteen and the rank of grand master at twenty-one. He participated in over twenty international chess tournaments and established world records for blindfold chess in 1924, 1925, and 1933. Alekhine won the chess world championship in 1927 from the Cuban chess player José Raoul Capablanca y Graupera, lost it to the Dutch chess player Max Euwe (qq.v.) in 1935, and regained it from Euwe in 1937. Alekhine also wrote numerous articles on chess. *See* CHESS.

ALEKSANDROPOL. *See* LENINAKAN.

ALEMÁN, Mateo (1547–1610?), Spanish novelist, born in Seville, and educated at the University of Seville. He is best known as the author of the novel *Guzman de Alfarache* (1599, Part II, 1604; Eng. trans., *The Rogue*, 1623). This book revived the Spanish picaresque novel, or story of a rogue (Sp. *picaro*) and his adventures. Alemán is the first picaresque author whose identity is definitely known. Among Spanish novels of this type *Guzman* is ranked second only to *Lazarillo de Tormes*, a novel written by an unknown author before 1555. *Guzman* went through more than fifteen editions in five years and has been widely translated. *See* PICARESQUE NOVEL.

ALEMÁN VALDÉS, Miguel (1902–), Mexican statesman, born in Sayula, and educated in law at the National University in Mexico City. In 1930 he was elected deputy from the State of Veracruz, becoming senator in 1935 and governor in 1936. He was minister of the interior from 1940 to 1945, when he resigned to run for president as the candidate of the National Revolutionary Party. Elected President of Mexico in December, 1946, he served in that post until 1952. In 1947 he visited the United States and became the first Mexican president to address the U.S. Congress. Other important events of his administration included the negotiation in 1947 of a $50,000,000 loan to Mexico from the Export-Import Bank of Washington (q.v.), the preparation of a twenty-year plan for the expansion of the government-controlled Mexican oil industry, and the granting of permission in 1949 to an American oil company to drill for oil in Mexico for the first time since the expropriations of 1938 (*see* MEXICO: *History*).

ALEMANNI. *See* ALAMANNI.

ALEMBERT, Jean le Rond d' (1717–83), French mathematician, philosopher, and encyclopedist, born in Paris. He was the illegitimate son of the French writer Claudine Alexandrine Guérin de Tencin (1685–1749), and was left as an infant on the steps of the chapel of Saint Jean le Rond, from which he received his name. He was educated at the Collège Mazarin where he excelled in mathematics, physics, and astronomy. At the age of twenty-two he wrote his first published work, *Mémoire sur le Calcul Intégral* ("Report on Integral Calculus", 1739). His most important scientific work, *Traité de Dynamique* ("Treatise on Dynamics", 1743), which marks an epoch in the science of mechanics, is based on the theory known as d'Alembert's principle, discovered by him at the age of twenty-six, and expressed in the proposition: The resultant of the forces impressed upon a system is equivalent to the effective force of the entire system. His *Réflexions sur la Cause Générale des Vents* ("Reflections on the General Cause of Winds", 1746) contains the first conception of the calculus of partial differential equations (*see* CALCULUS). In 1749 he proposed the first analytical solution of the precession of the equinoxes (*see* ECLIPTIC). In 1751 he became associated with the French encyclopedist Denis Diderot (q.v.) in editing the great French *Encyclopédie* (*see* ENCYCLOPEDIA; ENCYCLOPEDISTS). Although he withdrew from the editorship in 1758, because of government interference with the publication, d'Alembert continued to contribute articles on science and philosophy.

ALENÇON, town in France, and capital of Orne Department, on the Sarthe R., 30 miles N. of Le Mans. Industries include the manufacture of footwear, automobile chassis, and bricks, and the weaving, bleaching, and printing of linen and cotton cloth. The manufacture of *point d'Alençon*, a fine lace, established in 1665, is still carried on. Crystals of smoky quartz, known as Alençon diamonds, are found in the department. The town, capital of the old county and duchy of Alençon, was generally a royal possession from the 13th century and formally passed to the crown in 1525; it was the seat of the court of Margaret of Navarre (q.v.). Alençon suffered heavy damage in 1944, during World War II. Pop. (1968) 30,372.

ALENU. *See* PRAYER, JEWISH.

ALEPPO *or* **ALEP** (anc. *Beroea;* Ar. *Haleb* or *Halab*), city of Syria, and capital of Aleppo Governate, about 200 miles N.E. of Damascus, and about 60 miles S.E. of İskenderun, Turkey, which serves as its port. Aleppo lies on a plateau 1400 ft. high, midway between the Mediterranean Sea and the Euphrates R. The second-largest city of Syria, Aleppo is an agricultural trading center and has factories producing carpets, silk, cotton, and wool textiles, silver and gold ware, leather goods, and embroidery. Aleppo consists of an old and a new town; the former is enclosed within a wall dating from medieval times. Among the most important buildings are the modern citadel, surrounded by a moat and standing on a hill 200 ft. high, and the Zakaria Mosque, containing the tomb of Zacharias, father of John the Baptist (q.v.). Also in Aleppo are a number of European schools and Christian churches and missions. The city is connected by rail with Damascus, Syria, and Beirut, Lebanon, and by caravan route with Iraq, Kurdistan, and Turkish Armenia. In the 3rd century A.D., Aleppo became the greatest center of trade between Europe and the Orient. The history of the city, which was a Hittite settlement before 1000 B.C., parallels that of Syria. Pop. (1970) 639,361.

ALESSANDRIA, city in Italy, and capital of Alessandria Province, on the Tanaro R., about 47 miles N.W. of Genoa. It is a commercial and industrial center, producing principally hats. Alessandria was founded in 1168 by the people of Cremona, Milan, and Placentia (now Piacenza) as a bulwark against Frederick I (q.v.), Holy Roman Emperor, who was then attempting to subjugate northern Italy. It was named in honor of Pope Alexander III (*see under* ALEXANDER), chief opponent of the emperor, and was brought into the Lombard League (q.v.). Because of the strategic position of Alessandria on the Tanaro and as the central point of communication between Genoa, Turin, and Milan, the town has often been a scene of battle. Massimiliano Sforza (1493–1530), Duke of Milan, plundered Alessandria in 1522. In 1707, after obstinate resistance, it was taken by the Austrian general Eugene (q.v.), Prince of Savoy, during the War of the Spanish Succession; *see* SPANISH SUCCESSION, WAR OF THE. Following the defeat of Austria by France at the Battle of Marengo in 1800, during the Napoleonic Wars (q.v.), the French held the city for fourteen years. It was the principal stronghold of the Piedmontese during the insurrection of Lombardy and Venetia in 1848–49. Pop. (1971) 102,079.

ALESSANDRI PALMA, Arturo (1868–1950), Chilean statesman, born in Linares, and educated at the University of Chile. In 1898 he was elected to the Chamber of Deputies of the National Congress and served for six consecutive terms. After holding a number of cabinet posts he began to campaign for the presidency in 1918 as a spokesman for labor and the middle class. He was elected in 1920 and in the following year introduced a broad program of social and political reform, including the separation of church and state, and the direct election of the president and vice-president by popular vote. Alessandri resigned from the presidency in 1924, after a military junta had seized political power. He was recalled, however, by another junta of young army officers that had seized power in 1925, but he remained in office for only a short time before resigning. During this period he drafted and had ratified by popular vote the constitution under which Chile is now governed. Alessandri was president again from 1932 to 1938. During this term he created a central bank to stabilize the Chilean currency and introduced reforms of the tax system and monetary and banking laws. He was a candidate for the presidency again in 1946, but withdrew in favor of his son who was defeated.

ALETSCH, largest glacier of Europe, in the Alps (q.v.). It is about 12½ mi. long and sweeps around the S. side of the Jungfrau Mt. in the Swiss Alps. At the E. extremity lies a glacier lake, Marjelensee (7711 ft. above sea level). To the N.W. rises Aletschhorn Mt. (13,763 ft.), which was first climbed in 1859.

ALEUTIAN ISLANDS, chain of about 150 small islands of S.W. Alaska, separating the N. Pacific Ocean from the Bering Sea. The archipelago extends about 1200 miles W. from the Alaska Peninsula toward Kamchatka Peninsula, in the U.S.S.R. The four main subgroups of the Aleutian Islands from E. to W. are the Fox Islands, Andreanof Islands, Rat Islands, and Near Islands.

Geologically, the archipelago is a continuation of the Aleutian Range, which is on the Alaskan mainland, and contains a number of volcanic peaks. Shishaldin (9387 ft.), on Unimak Island is the highest volcano. Few trees, all of stunted growth, are found, but grasses grow in abundance. Although a few good harbors are found in the archipelago, navigation is dangerous because of perpetual fog and numerous reefs. The aborigines, known as Aleuts, belong to the Eskimo-Aleut linguistic group but are generally classified ethnologically as North American Indians. Fishing, hunting, and sheep raising are the principal pursuits of the inhabitants. The chief trade center is Unalaska, on the island of Unalaska (q.v.). The Aleutians were discovered in 1741 by the Russian navigator Alexi Ilich Chirikov (d. 1748) and Vitus Bering (q.v.), a Danish navigator in the service of Russia. During World War II, in June, 1942, Japanese forces occupied Attu and Kiska islands, in the Aleutians, but were forced to surrender the islands to the American forces the following year.

ALEUTS. *See* ALASKA: *The People.*

ALEWIFE, common name for a food fish, *Pomolobus pseudoharengus,* of the Herring family (Clupeidae). It resembles the shad in shape and color, but is only 10 to 12 in. long. Early in the summer the alewife appears in great numbers on the east coast of North America and enters the rivers to spawn. Many of the fish are caught and used for food or fertilizer. The alewife also is called the spring herring; the French Canadian name for the fish is gaspereau. *See* HERRING.

ALEXANDER, name of eight popes, the most famous of whom were the following.

Alexander III (d. 1181), original name ORLANDO BANDINELLI, pope from 1159 to 1181, born in Siena, Italy. He taught and wrote on the subject of canon law and in 1159 was chosen to succeed Pope Adrian IV (*see under* ADRIAN). As pope he forced Henry II (q.v.), King of England, to do public penance for the murder of Thomas à Becket (q.v.), Archbishop of Canterbury. After a long struggle with three successive antipopes who were supported by Frederick I (q.v.), Holy Roman Emperor, Alexander, aided by the Lombard League (q.v.), forced Frederick to recognize his own elevation to the papacy. Alexander III wrote the church law requiring the election of popes by a two-thirds vote of the cardinals.

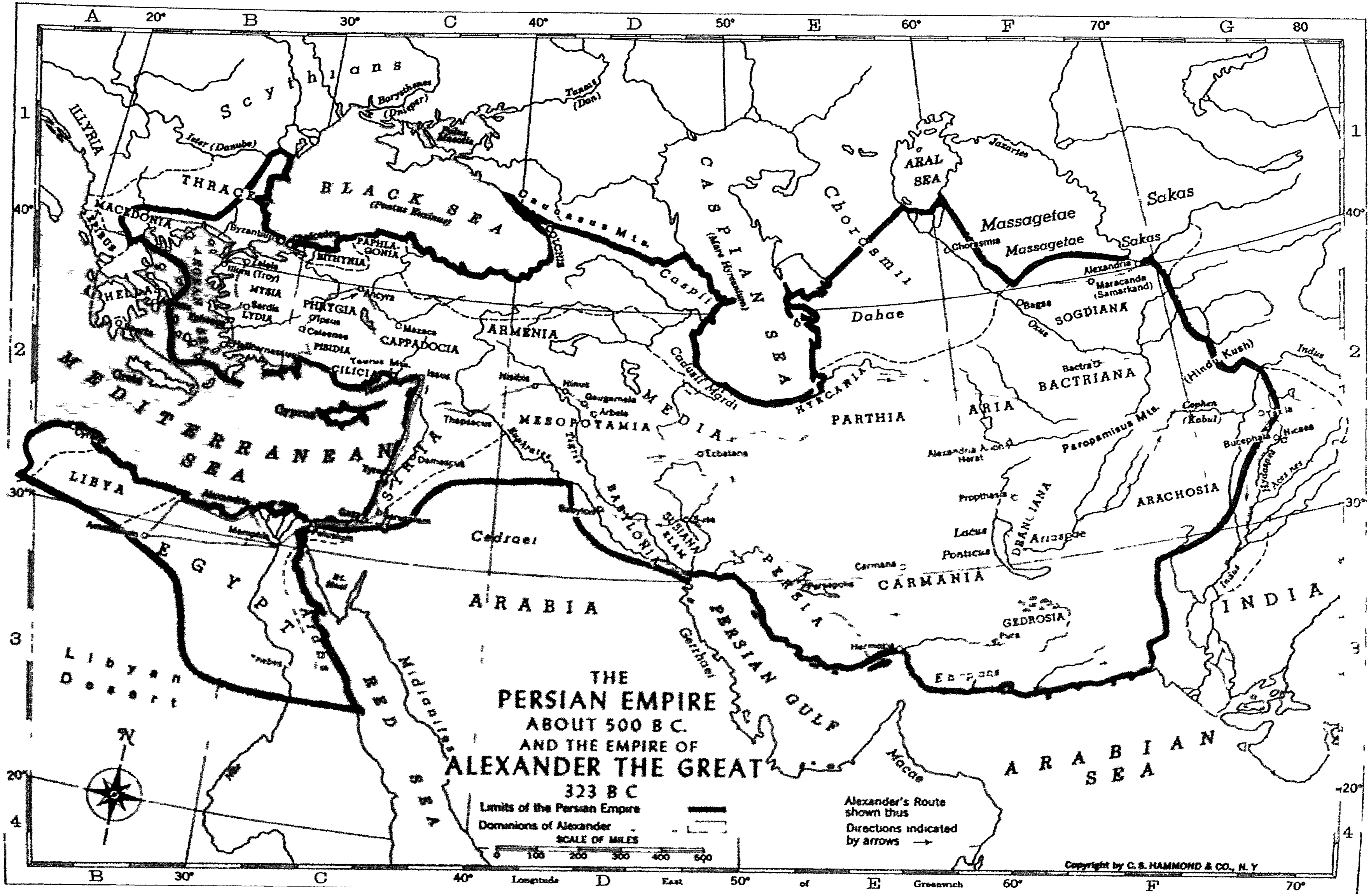
Alexander VI (1431–1503), original name RODRIGO BORGIA, pope from 1492 to 1503, born probably in Játiva, near Valencia, Spain. He was adopted into the family of his maternal uncle, Pope Callistus III (1378–1458). As Rodrigo Borgia he became successively a bishop, a cardinal, and an able administrator in the papal court. He acquired wealth and lived a life of pleasure even after his elevation to the papacy, which he secured by bribery in 1492. As pope he recovered the territories of the Papal States (q.v.), which had been ruled by local tyrants, issued a papal bull dividing the New World between Spain and Portugal, and ordered the execution of the Italian church reformer Girolamo Savonarola (q.v.). He greatly increased the fortunes of his children principally by the thinly disguised robbery of nobles and ecclesiastics, a number of whom he caused to be assassinated or poisoned.

ALEXANDER III, known as THE GREAT (356–323 B.C.), King of Macedonia and conqueror of the eastern world, born in Pella, the ancient capital of Macedonia, the son of Philip II (q.v.), King of Macedonia, and of Olympias (d. 316 B.C.), a princess of Epirus. The Greek philosopher Aristotle (q.v.) was Alexander's tutor; he gave Alexander a thorough training in rhetoric and literature, and stimulated his interest in science, medicine, and philosophy. In the summer of 336 B.C. Philip was assassinated, and Alexander ascended the Macedonian throne. He found himself surrounded by enemies at home and threatened by rebellion abroad. Alexander disposed quickly of all conspirators and domestic enemies by ordering their execution. Then he descended upon Thessaly, where partisans of independence had gained ascendancy, and restored Macedonian rule. Before the end of the summer of 336 B.C. he had reestablished his position in Greece and was elected by a congress of states at Corinth. As general of the Greeks in a campaign against the Persians originally planned by his father in 335 B.C. he carried out a successful campaign against the defecting Thracians, penetrating to the Danube R. On his return he crushed in a single week the threatening Illyrians, and then hastened to Thebes, which had revolted. He took the city by storm and razed it, sparing only the temples of the gods and the house of the Greek lyric poet Pindar (q.v.), and selling the surviving inhabitants, about 8000 in number, into slavery. Alexander's promptness in crushing the revolt of Thebes brought the other Greek states into instant and abject submission.

Alexander began his war against Persia in the spring of 334 B.C. by crossing the Hellespont (modern Dardanelles) with an army of 35,000 Macedonian and Greek troops; his chief officers, all Macedonians, included Antigonus, Ptolemy, and Seleucus (qq.v.). At the river Granicus, near the ancient city of Troy, he attacked an army of Persians and Greek mercenaries totaling 40,000 men. His forces defeated the

A mosaic depicting Alexander the Great in battle

Bettmann Archive



THE
PERSIAN EMPIRE
ABOUT 500 B C.
AND THE EMPIRE OF
ALEXANDER THE GREAT
323 B C

Limits of the Persian Empire
Dominions of Alexander
SCALE OF MILES
0 100 200 300 400 500

Alexander's Route shown thus
Directions indicated by arrows →

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enemy and, according to tradition, lost only 110 men, after this battle, all the states of Asia Minor submitted to him. In passing through Phrygia he is said to have cut with his sword the Gordian knot (q.v.). Continuing to advance southward, Alexander encountered the main Persian army, commanded by King Darius III (*see under* DARIUS), at Issus, in northeastern Syria. The size of Darius' army is unknown, the ancient tradition that it contained 500,000 men is now considered a fantastic exaggeration. The Battle of Issus, in 333 B.C., ended in a great victory for Alexander. Cut off from his base, Darius fled northward, abandoning his mother, wife, and children to Alexander, who treated them with the respect due to royalty. Tyre, a strongly fortified seaport, offered obstinate resistance, but Alexander took it by storm in 332 B.C. after a siege of seven months. Alexander captured Gaza next and then passed on into Egypt, where he was greeted as a deliverer. By these successes he secured control of the entire eastern Mediterranean coastline. Later in 332 B.C. he founded, at the mouth of the Nile R., the city of Alexandria, which later became the literary, scientific, and commercial center of the Greek world. Cyrene, the capital of the ancient North African kingdom of Cyrenaica, submitted to Alexander soon afterward, extending his dominion to Carthaginian territory.

In the spring of 331 B.C. Alexander made a pilgrimage to the great temple and oracle of Amen-Ra, Egyptian god of the sun, whom the Greeks identified with Zeus. The earlier Egyptian pharaohs were believed to be sons of Amen-Ra; and Alexander, the new ruler of Egypt, wanted the god to acknowledge him as his son. The pilgrimage apparently was successful, and it may have confirmed in him a belief in his own divine origin. Turning northward again, he reorganized his forces at Tyre and started for Babylon with an army of 40,000 infantry and 7000 cavalry. Crossing the Euphrates and the Tigris rivers, he met Darius at the head of an army of unknown size, which, according to the exaggerated accounts of antiquity, was said to number 1,000,000 men, this army he completely defeated in the Battle of Arbela (q.v.) on the plain of Guagamela, on Oct. 1, 331 B.C. Darius fled as he had done at Issus, and was later slain by two of his own generals. Babylon surrendered after Gaugamela, and the city of Susa with its enormous treasures was soon conquered. Then, in mid-winter, he forced his way to Persepolis, the Persian capital. After plundering the royal treasuries and taking other rich booty he burned the city and thus completed the destruction of the ancient Persian Empire. His domain now extended along and beyond the southern shores of the Caspian Sea, including modern Afghanistan and Baluchistan, and northward into Bactria and Sogdiana, the modern Russian Turkestan, now called Soviet Central Asia. It had taken Alexander only three years, from the spring of 330 B.C. to the spring of 327 B.C., to master this vast area.

In order to complete his conquest of the remnants of the Persian empire, which had once included part of western India, Alexander crossed the Indus R. in 326 B.C., and invaded the Punjab as far as the river Hyphasis (modern Beas), at this point the Macedonians rebelled and refused to go farther. Alexander then constructed a fleet and passed down the Indus, reaching its mouth in September, 325 B.C. The fleet sailed thence to the Persian Gulf. With his army, he returned overland across the desert to Media. Shortages of food and water caused severe losses and hardship among his troops. Alexander spent about a year organizing his dominions and completing a survey of the Persian Gulf in preparation for further conquests. He arrived in Babylon in the spring of 323 B.C. The following June he contracted a fever and died. He left his empire, in his own words, "to the strongest", this ambiguous testament resulted in dire conflicts for half a century.

Alexander was one of the greatest generals of all time, noted for his brilliance as a tactician and troop leader and for the rapidity with which he could traverse great expanses of territory. He was usually brave and generous, but could be ruthless when politics demanded. At times he was cruel, having, for example, killed his friend Clitus (d. 328 B.C.) in a drunken fury. He later regretted this act deeply. As a statesman and ruler his plans were grandiose; according to many modern historians he cherished a scheme for uniting the East and the West in a world empire, a new and enlightened "world brotherhood of all men". He trained thousands of Persian youths in Macedonian tactics and enrolled them in his army. He himself adopted Persian manners and married Eastern wives, namely, Roxana, daughter of Oxyartes of Sogdiana, and Barsine (or Stateira), the elder daughter of Darius, and he encouraged and bribed his officers to take Persian wives. Shortly before he died Alexander ordered the Greek cities to worship him as a god. Though he probably gave the order for political reasons, he was, in his own view and that of his contemporaries, of divine birth. In any case, the order was largely nullified by his death shortly after he issued it.

To bind his conquests together, Alexander founded a number of cities, most of them named Alexandria, along his line of march; these cities were well located, well paved, and provided with good water supplies. Greek veterans from his army settled in them, young men, traders, merchants, and scholars were attracted to them, Greek culture was introduced, and the Greek language became widely known. Thus Alexander vastly extended the influence of Greek civilization and prepared the way for the kingdoms of the Hellenistic period and the conquests of the Roman Empire.

See also ALEXANDER LEGEND.

ALEXANDER, name of three emperors of Russia.

Alexander I (1777–1825), Emperor (1801–25), son of Emperor Paul I (1754–1801). He abolished many barbarous and cruel punishments then in use, and in 1802 introduced a more orderly administration of government by the creation of eight ministries. He improved the condition of the serfs (*see* SERFDOM), and promoted education, doubling the number of Russian universities by establishing those at Saint Petersburg (now Leningrad), Khar'kov, and Kazan'. Alexander was for a time the ally of Prussia against Napoleon I (q.v.), Emperor of France. In 1807, however, after the battles of Eylau and Friedland, Alexander allied himself with Napoleon. He broke the alliance with Napoleon in 1812. In the same year Napoleon invaded Russia, only to lose his army in a disastrous retreat from Moscow. Alexander was prominent thereafter in the European coalition that led to Napoleon's fall. In 1815 Alexander instituted the Holy Alliance (q.v.) of Austria, Russia, and Prussia. The purpose of the alliance, as it was conceived, was to achieve the realization of high Christian ideals among the nations of Europe; the alliance, however, soon ceased to have any real importance in European politics. The last years of Alexander's life and reign were reactionary and despotic. He was succeeded by his brother Nicholas I (q.v.).

Alexander II (1818–81), Emperor (1855–81), son of Nicholas I (q.v.), Emperor of Russia, and nephew of Alexander I. He ascended the throne during the Crimean War (q.v.), and in 1856 signed the Treaty of Paris, which brought the hostilities to an end (*see* RUSSIA: *The Russian Empire*). After establishing committees to study the need for reform, Alexander II abolished serfdom throughout Russia. He also abolished corporal punishment, established local self-government, initiated judicial reform, revised the educational system, and developed a system of universal military service. Under his rule the administration of the police was greatly improved and military operations in Central Asia and in a war with Turkey (1877–78) were highly successful. The Russian possessions in North America, now comprising the State of Alaska, were ceded to the United States in 1867. Alexander was assassinated by a bomb thrown into his carriage by a member of a revolutionary group, the Narodnaya Volya (People's Will).

Alexander III (1845–94), Emperor (1881–94), son of Alexander II. In reaction to the assassination of his father, he restored much of the absolutism of the reign of Nicholas I, and sternly repressed all revolutionary agitation. Alexander reestablished censorship of the press and restricted education. His foreign policy was especially marked by a close union with France in opposition to the Triple Alliance (q.v.). He was succeeded by his son, Nicholas II (q.v.).

ALEXANDER, name of three kings of Scotland.

Alexander I (about 1078–1124), King (1107–24). Because of his stern suppression of an insurrection in northern Scotland he was called Alexander the Fierce. He worked for the independence of the Scottish Church and founded a number of bishoprics as well as the abbeys of Scone (q.v.) in Perth County and Inchcolm, on an island in the Firth of Forth.

Alexander II (1198–1249), King (1214–49). He aided the English barons in securing the Magna Charta (q.v.) from John (q.v.), King of England.

Alexander III (1241–85), King (1249–85), son of Alexander II. He repulsed an invasion by the Norwegians in 1263 and, by the terms of a treaty (1266), Magnus VI (*see under* MAGNUS), King of Norway, ceded the Hebrides (q.v.) to Scotland. Alexander was the subject of *Lament for Alisaunder*, an old Scottish poem.

See SCOTLAND: *History*.

ALEXANDER I (1888–1934), King of Yugoslavia (1921–34), second son of Peter I of Serbia (*see under* PETER: *Serbia*). He became crown prince of Serbia in 1909, upon the renunciation of the succession by his brother George. Alexander served in the Serbian army in the Balkan War (1912) and in World War I. In 1918 he became prince-regent of the newly established Kingdom of the Serbs, Croats, and Slovenes, and three years later he became king. Because of disorders in the kingdom, arising chiefly from the Croatian autonomy movement (*see* CROATIA), he dismissed the parliament in 1929, abolished the constitution, and set up a royal dictatorship. To emphasize the unity he hoped to enforce, he changed the name of the kingdom to Yugoslavia. On Oct. 9, 1934, while on an official visit to France, he was assassinated in Marseille, together with Louis Barthou (1862–1934), French foreign minister, by a Croatian nationalist. He was succeeded by his son, Peter II (*see under* PETER *Yugoslavia*). *See* YUGOSLAVIA: *History*.

ALEXANDER OF HALES, known as DOCTOR IRREFRAGABILIS (1185?–1245), English theologian and philosopher, born in Hales, Gloucestershire, and educated in Paris. About 1237 he entered the order of the Franciscans. He became a lecturer on philosophy and theology at Paris. His work was included in a vast exposition of doctrine known as the *Summa Theologica* ("Compendium, or Summary, of Theology"), compiled after his death and credited to him. Alexander of Hales introduced Aristotelian principles into Christian theological discussion.

ALEXANDER THE GREAT. See ALEXANDER III.

ALEXANDER, Grover Cleveland (1887–1950), American professional baseball player, born in Saint Paul, Nebr. He was pitcher in the National League from 1911 to 1930, for the Philadelphia, Chicago, and Saint Louis teams. In 1938 he was elected to the Baseball Hall of Fame (*see* BASEBALL HALL OF FAME AND MUSEUM, NATIONAL).

ALEXANDER, Harold Rupert Leofric George, 1st Earl Alexander of Tunis (1891–69), British field marshal, born in County Tyrone in what is now Northern Ireland, and educated at the Royal Military College, Sandhurst. Following distinguished service as an officer during World War I, he held various positions in the British army, including command of a brigade in India. In 1938 he was appointed major general. In 1939, after the outbreak of World War II, Alexander commanded the 1st Division in France. Later, as commander of the I Corps, he directed the evacuation of the British army from Dunkirk. Appointed commander in chief of British forces in the Middle East in August, 1942, he organized the drive on Tunis in October to December, 1942. In February, 1943, he became deputy commander in chief, under General Dwight David Eisenhower (q.v.), of all Allied ground forces in North Africa, and later that year directed the invasions of Sicily and Italy. He succeeded General Eisenhower as Supreme Allied Commander in the Mediterranean Theater of Operations in 1944, and advanced to the rank of field marshal in November. Alexander was governor-general of Canada from 1946 to 1952 and British defense minister from 1952 to 1954. He was granted the title of viscount in 1946 and of earl in 1952. His *The Alexander Memoirs, 1940–1945,* was published in 1962.

ALEXANDER, Samuel (1859–1938), British philosopher, born in Sydney, Australia, and educated in Melbourne and at the University of Oxford. He gave up a fellowship at Oxford to study psychology in Germany (1890–91) because he felt the need to relate philosophy with the new discoveries in experimental psychology. He is one of the few philosophers of the 20th century to develop a comprehensive metaphysical system. The basic tenets of this system are expressed in his major work, *Space, Time, and Deity* (1920). *Space-time* is the cosmic system from which different categories of existence are evolving in an infinite series. The primary categories are matter, life, and mind. Alexander found the cosmic order tending toward an end, which he termed *Deity*. Mind, one of the primary categories, is endowed with the unique property of consciousness, through which it may achieve Deity. Within the context of this system, Alexander dealt with traditional philosophical problems, such as the relation of mind and body, moral values, and the nature of knowledge. In his later years, he became interested in aesthetics, with which *Beauty and Other Forms of Value* (1933) is concerned. Alexander was awarded the British Order of Merit in 1930.

ALEXANDER, Sir William, Earl of Stirling (1567?–1640), Scottish poet and courtier, born probably in Menstrie, and educated probably at the universities of Glasgow and Leiden. He became attached to the court of King James VI of Scotland, later James I (q.v.), King of England, and was tutor to the King's oldest son, Prince Henry (1594–1612). Alexander was knighted in 1609, and in 1615 he was appointed to a seat in the Scottish privy council. In 1621 King James granted him a huge tract of land in America, including the region comprising the present-day Nova Scotia and Newfoundland (qq.v.). Although Charles I (q.v.), King of England, later confirmed the grant, the territory was ceded to France in 1632. Alexander became secretary of state for Scotland in 1626 and served in that post until his death. He was raised to the peerage in 1630.

His principal works include the collection of sonnets *Aurora* and the tragedies *Darius* (1603), *Croesus* (1604), *The Alexandrean* (1605), and *Julius Caesar* (1607). The tragedies contain several distinguished soliloquies. Among his other works are the epic *Doomesday, or The Great Day of the Lord's Judgment* (1614) and the poems "Paraenesis to the Prince" and "An Elegie on the Death of Prince Henry".

ALEXANDER, William, known as LORD STIRLING (1726–83), American soldier, born in New York City. He served in the French and Indian War, first as commissary and then as aidede-camp to the American colonial governor of Massachusetts William Shirley (q.v.) In 1756 he went to England to defend Shirley against the charge of neglect of duty and to urge a claim of his own before the House of Lords to the earldom of Stirling This claim was rejected, and in 1761 he returned to America. Alexander soon became surveyor-general and a member of the Provincial Council, and in November, 1775, enlisted as a colonel in a New Jersey regiment In 1776 he was promoted to brigadier general, as such he took part in the American Revolutionary battles of Long Island, Brandywine, Germantown, and Monmouth (see AMERICAN REVOLUTION) Alexander was one of the founders and the first governor of King's College (now Columbia University)

ALEXANDER ARCHIPELAGO, group of about 1100 islands in the Pacific Ocean, off the SE coast of Alaska The islands and the mainland coast form the Alaskan Panhandle. The principal islands include Admiralty, Baranof, Chichagof, Etolin, Kuiu, Kupreanof, Prince of Wales (q.v.), the largest island in the archipelago, and Revillagigedo The largest city in the archipelago is Ketchikan (q.v.), on Revillagigedo. The second largest city, Sitka (q.v.), is on Baranof Island, named for the Russian fur trader Aleksandr Andreyevich Baranov (1746–1819), who took possession of the island in 1799 for Russia. The islands, which are a submerged mountain system, form the sheltered channels that are part of the maritime tourist route between Seattle, Wash., and Alaska Industries include canning, fishing, fur trapping, lumbering, and uranium mining

ALEXANDER CITY, city of Alabama, in Tallapoosa Co., about 45 miles NE of Montgomery The city is in a corn, cotton, and dairy region. Manufactures include textiles, and lumber and metal products Originally known as Youngville, the city was incorporated as Alexander City in 1873. Pop (1960) 13,140; (1970) 12,358.

ALEXANDER LEGEND, famous but largely fictitious account of the adventures of the Macedonian conqueror Alexander III (q.v.), known as the Great, which was the basis of many romantic works in the Middle Ages. The legend originated at Alexandria, in the Arab Republic of Egypt. The historical narrative of the Greek philosopher Callisthenes (360?–328? B.C.) having been lost, there appeared about 200 A.D. under his name a Greek story (sometimes referred to as the pseudo-Callisthenes) that represented Alexander as really the son of Nectanebo (r. 361–40 B.C.), the last king of Egypt, and credited him with a fabulous series of exploits in connection with his actual conquests. This compendium of legendary lore about Alexander was translated into Latin early in the 4th century. About the 12th century several French poems were based on the Alexander legend. The best known is the great *Chanson d'Alexandre* ("The Song of Alexander"), traditionally ascribed to the Provençal poet Alexandre de Bernai (fl about 1190) The twelve syllable line in which *Chanson* is written now is called an Alexandrine (q.v.)

In the literature of the Middle Ages, Alexander was essentially a medieval knight He became one of the nine worthies, and one of the four kings in the game of cards More or less original versions of the legend appear in poems of nearly every European country as well as the Orient, where the story of the pseudo-Callisthenes was rendered into Syrian and Armenian as early as the 5th century Some Slavic forms of the tale are derived from this Eastern version The most notable versions composed in western Europe, after the French poems, are perhaps the German ones written in the 13th century In Spain the *Libro de Alixandre* ("Book of Alexander") is one of the oldest great Spanish poems. The earliest English version of this legend is probably a poem entitled *Lyfe of Alisaunder,* composed about 1330

ALEXANDER NEVSKI (1220?–63), Russian hero and saint, born in Vladimir Suzdal (now Vladimir) As prince of Novgorod, he won (1240) an important victory over the Swedes on the Neva R., near the site of modern Leningrad. Two years later he repulsed the Livonian Knights and the Lithuanians, thereby protecting the northern border of Russia After 1240 Russia was under the domination of the Mongols or Tatars (q.v.) Alexander Nevski succeeded his father in 1246 as grand duke of Kiev and Novgorod and in 1252 he was appointed grand duke of Vladimir by the khan of the Golden Horde (q.v.) He is recognized as a saint by the Russian Orthodox Church and his feast day is observed Sept 12 See RUSSIA *House of Rurik.*

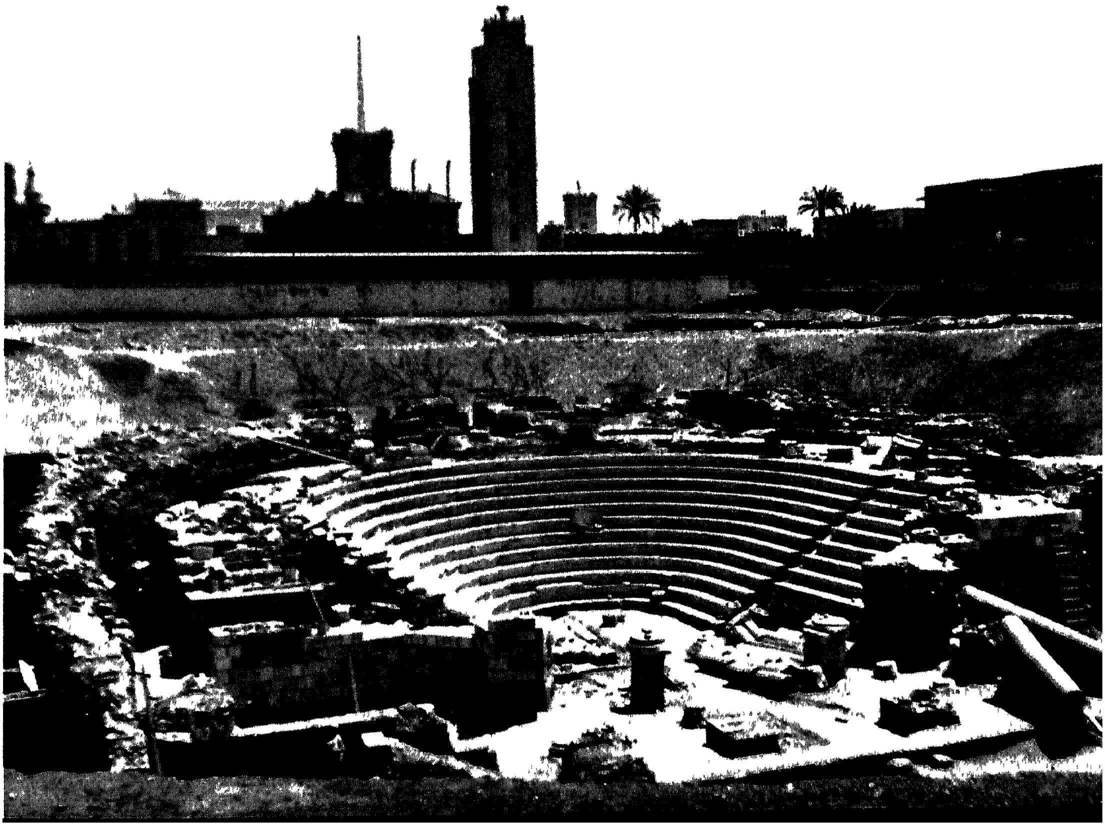
ALEXANDRA, Caroline Marie Charlotte Louisa Julia (1844–1925), Queen Consort of Edward VII (q.v.), King of Great Britain. She was born in Copenhagen, Denmark, the daughter of Prince Christian of Glucksburg, later King of Denmark as Christian IX (q.v.). On her marriage in 1863 to Albert Edward, Prince of Wales, afterwards Edward VII, she was welcomed to England as the "Sea King's Daughter", a term from a poem by the British poet Alfred, Lord Tennyson (q.v.), "A Welcome to Alexandra". Queen Alexandra lived a simple life, participating in many benevolent activities, particularly those devoted to the care of the sick An accomplished musician, she held an honorary doctorate in music

ALEXANDRIA, city in Louisiana, and parish seat of Rapides Parish, on the Red R, 95 miles NW of Baton Rouge The city has railroad and airline service and is the retail trade center for the surrounding agricultural region noted for cotton, pecans, sugar cane, and livestock The principal manufactures are chemicals, foodstuffs, furniture, and wood products A branch of Louisiana State University is located in the city Alexandria was settled in 1785 and received a city charter in 1832 Pop (1960) 40,279, (1970) 41,557

ALEXANDRIA, city of Virginia, on the Potomac R, 7 miles S of Washington, D.C Industries include the manufacture of electronic equipment, iron, and dairy products. The city is the site of the Protestant Episcopal Theological Seminary (1823) and of the Episcopal High School (1839, boys). The old part of the city, containing many historic buildings, is a tourist attraction Alexandria was founded about 1731, it received it present name and was incorporated in 1749 At the time of the American Revolution, it was a leading colonial trade center and port Pop (1960) 91,023, (1970) 110,938

ALEXANDRIA, city and principal seaport of the Arab Republic of Egypt, at the Canopic, or westernmost mouth of the Nile R, on a ridge that separates Lake Mareotis from the Mediterranean Sea, about 125 miles NW of Cairo The city was founded in 332 BC by Alexander III (q v), known as Alexander the Great, King of Macedonia, who had planned it as one of the finest ports of the ancient world A mole nearly a mile in length called the Heptastadion ("seven furlongs") was built to the island of Pharos, enclosing a spacious harbor A famous lighthouse, considered one of the Seven Wonders of the World (q v), was also built on Pharos Another, smaller harbor was open to the W A canal joined Lake Mareotis to the Canopic branch of the Nile

The ancient city was about 4 mi long, and regularly built, with streets crossing at right angles and colonnades adorning the principal streets. The most magnificent quarter of the city, called the Brucheium, was situated on the E harbor Farther W was the Serapeion, or temple of the Egyptian deity Serapis; the Soma, or mausoleum of Alexander the Great and of the Ptolemies (*see* PTOLEMY), the Poseidonium, or temple of Poseidon, god of the sea, the museum, the great theater, and the emporium, or exchange. The NE quarter was occupied by the Jews In Alexandria the Jews came in contact



In 1967 in Alexandria, a city dominated by Greek tradition, diggers made this startling discovery of an ancient Roman theater

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with Greek learning, profoundly influencing the later religious thought of the world, here the Greek translation of the Old Testament, called the Septuagint (*see* Bible, Versions of the), was made before 100 A.D. Later philosophers attempted to fuse the doctrines of Christianity with Greek philosophy.

Soon after the city was founded, the population, consisting chiefly of Greeks, Jews, and Egyptians, numbered 300,000 free citizens, exclusive of slaves and strangers. Alexandria was made the capital of Egypt, numerous palaces were built by the Ptolemies, the Alexandrian Library (q.v.) and Museum were founded, and influential schools of philosophy, rhetoric, and other branches of ancient learning were established (*see* Alexandrian Age). Under the Ptolemies the city became the literary and scientific center of the ancient world. After the defeat of Cleopatra, Queen of Egypt, at Actium in 31 B.C. and her suicide the following year, the city came under the rule of Octavian, later the Roman emperor Augustus (q.v.), and was governed by a prefect appointed by him. Its position made it the center of commerce between East and West, and fleets of grain ships sailed from Alexandria to Italy year after year. Gradually, however, the city lost its prosperity. A Jewish revolt in 116 A.D. resulted in the annihilation of the Jewish population and the destruction of a large portion of the city. In 215 the Roman emperor Caracalla (q.v.) ordered a massacre of the male inhabitants of the entire city for reasons that remain obscure, but may have been a punishment for some form of seditious conduct. The founding of Constantinople (now İstanbul; q.v.) further eclipsed the Egyptian metropolis. The Muslims, under the general Amr ibn-al-As (594?–664) besieged, captured, and almost destroyed the city in 638 and again about 646. Under Muslim rule the city declined, particularly after the rise of Cairo after about 968. The opening of the sea route to India in the 15th century also contributed to the decline of the city, further reducing its importance as a trade center. Alexandria was captured and held from 1798 to 1801 by the French emperor Napoleon I (q.v.).

The modern city is situated mainly on a peninsula about the mole, reaching to and including the island of Pharos, and on the portion of the mainland immediately S. of the E. harbor. The part of the modern city on the peninsula is a characteristicly Egyptian town; the European quarter is on the mainland. Alexandria has had, since ancient times, two harbors, of which the W. one is the chief commercial center and the site of the customs house and many warehouses for cotton, grain, sugar, and wool. Over 80 percent of the imports and exports of the country pass through the city. Pop. (1970 est.) 2,032,000.

ALEXANDRIAN AGE, period in which Greek culture and learning were centered in the Egyptian city of Alexandria (q.v.). This age began in the late 4th century B.C., during the reign of the Macedonian king of Egypt Ptolemy I, surnamed Soter (*see under* Ptolemy), it continued throughout the reign of the Ptolemies, which ended with the death of Queen Cleopatra (q.v.) of Egypt in 30 B.C., and extended into the period of the Roman Empire when Egypt was under the domination of Rome (*see* Rome, History of).

The literature of ancient Greece, especially poetry, had flourished in the period of Athenian political domination (5th century B.C.). As the political domination of Athens gave way to Macedon beginning in the 4th century B.C., the literary domination of Athens also declined, giving way to Alexandria. The Egyptian city became the center of literature and also of science under the Ptolemies, who used their wealth to attract poets, scholars, and artists to their capital. The great library founded by Ptolemy I Soter contained the greatest collection of books in the ancient world (*see* Alexandrian Library). Favorite poetic forms of Alexandrian authors were the epigram, the elegy, the short epic, and the bucolic poem. Many Alexandrian poets, however, were imitators, they studied the works of their predecessors and reproduced the old forms more or less closely, but for the most part they lacked creative power. In poetry, as in other fields, the Alexandrian Age is marked primarily by scholarship rather than by inspiration. Alexandrian poems were usually short, and the chief subjects were mythology and human emotion. Noted Alexandrian poets were Callimachus (q.v.), the author of hymns and epigrams; Apollonius of Rhodes (q.v.), hardly typical of the age in that he composed a long epic on the Argonauts (q.v.); and Theocritus (q.v.), the first and greatest of Greek bucolic poets. Other Greek poets of the Alexandrian Age include Aratus of Soli (315?–245? B.C.), Nicander (fl. 2nd century B.C. or earlier), Euphorion (fl. 3rd century B.C.), and Lycophron (fl. 3rd century B.C.).

During the Ptolemaic period the intellectual activity of Alexandria included also a school of literary scholarship, in which the study of philology, grammar, prosody, lexicography, and literary criticism flourished. These subjects, together with geography, mathematics, astronomy, and medicine dominated the prose of the period.

At this time the sciences of mathematics and astronomy also flourished The most important Greek mathematicians in the pre-Christian period were Euclid, Apollonius of Perga, Eratosthenes, Aristarchus of Samos, Hipparchus, Hero of Alexandria, and Archimedes (qq v) In the fields of pure and applied sciences the Alexandrian Age achieved much For example, Aristarchus wrote on the size and distance of the sun and the moon and believed that the earth revolved around the sun, Euclid composed the first systematic treatise on geometry, Archimedes applied mathematics to hydrostatics, Apollonius of Perga wrote the first systematic treatise on conic sections, Eratosthenes calculated the circumference of the earth and devised a calendar that became the basis of the Julian calendar, and Hipparchus determined within six minutes the length of the solar year

After the fall of the Ptolemaic dynasty, although literary activity was centered in Rome, the museum, libraries, and schools of Alexandria continued to make it an influential intellectual center The schools of philosophy in particular prospered, including schools of Christian theology as well as of Neoplatonism (q v), which originated at Alexandria early in the 3rd century A D The interest in science continued, and in the 2nd century A D Claudius Ptolemaeus, better known as Ptolemy (q.v.), devised a system of astronomy and geography based on the earth as the center of the cosmos With the Muslim conquest of the city in 641 A D, Alexandria ceased to be a center of Occidental learning

ALEXANDRIAN CODEX, *or* (Lat. *CODEX ALEXANDRINUS*)

See Bible Scholarship.

ALEXANDRIAN LIBRARY, famous ancient library of Alexandria, Egypt. Founded by Ptolemy I Soter (*see under* Ptolemy), King of Egypt, it was expanded by his son Ptolemy II Philadelphus into the greatest collection of books in the ancient world early in the 3rd century B.C. The scholars in charge included the ablest Alexandrian men of letters of the period. Zenodotus (3rd century B.C) of Ephesus, whose specialty was the classification of poetry, was the first to hold the position of librarian. The poet Callimachus made the first general catalogue of the books, and apparently was also librarian. The two most noted librarians were Aristophanes of Byzantium (257?–180? B.C.) and Aristarchus (220?–150? B.C.) of Samothrace, both great editors and grammarians. In the time of Ptolemy II, according to one historian, the main library in the Alexandrian Museum contained nearly 500,000 volumes, or rolls, and an annex in the Temple of Serapis contained some 43,000 volumes. Most of the writings of antiquity were preserved in these collections, from which copies were made and disseminated to libraries throughout the civilized world

It is largely through such copies that ancient works have survived to modern times, for the Alexandrian Library was partially or wholly destroyed on several occasions. In 47 B C, during the civil war between the Roman statesman Gaius Julius Caesar and the followers of Pompey the Great, Caesar was besieged in Alexandria, a fire that destroyed the Egyptian fleet spread through some stores of books, about 40,000 of which were ruined A few years later the Roman emperor Marcus Antonius (Mark Antony) presented to Cleopatra, Queen of Egypt, books of the library of the city of Pergamum (q v), in Asia Minor According to legend, the library at Alexandria was burned three times· in 272 A D (by order of the Roman emperor Lucius Domitius Aurelianus), in 391 A D (under the Roman emperor Theodosius I), and in 640 A D (by Muslims under the caliph Omar I). See separate articles on the various historical figures mentioned

ALEXANDRINE, in verse, a line of twelve syllables constituting six iambic feet. When the end rhyme is feminine, the line contains thirteen syllables *See* Versification The name is considered by some scholars to derive from a 12th-century French collection of romances concerning the Macedonian conqueror Alexander III (q v), known as the Great (*see* Alexander Legend) For centuries the Alexandrine was little used in French verse and had no regular pauses. It first became popular in the 16th century in the work of Pierre de Ronsard (q.v.) The Alexandrine soon became accepted as the standard line in heroic verse for epic narrative, tragedy, and high comedy, and as a result the pauses were more strictly regulated. It remained preeminent in French verse until the middle of the 19th century.

The Alexandrine has been used in English verse primarily as a variation within a pattern of decasyllabic lines, as in the Spenserian stanza (*see* Spenser, Edmund) and in the heroic couplets of the English poets John Dryden and Alexander Pope (qq.v). *Polyolbion* (1622) by the English poet Michael Drayton (q v.) is the only important long poem in English which is written exclusively in Alexandrines.

ALEXANDROPOL. *See* Leninakan

ALEXIS I MIKHAILOVICH (1629–76), second Russian czar of the house of Romanov and father of Peter the Great (*see* Peter I) He succeeded his father Michael (1596–1645) in 1645 As a result of two campaigns by Alexis against the Poles (1654–56 and 1660–67), Russia gained Smolensk, Kiev, and the lands east of the Dnieper R. The war with Sweden (1656–58) was not as successful; Alexis was forced to withdraw from the lands he had taken. The reign of Czar Alexis was also marked by internal revolt, a schism in the Russian Orthodox Church, and the formulation of a new legal code that extended the serfdom of the Russian peasant.

ALEXIUS I COMNENUS (1048–1118), Byzantine Emperor (1081–1118), born in Constantinople (now İstanbul), the nephew of the emperor Isaac I Comnenus (*see under* COMNENUS). Alexius had marked military ability; his devoted soldiers elevated him to the throne in 1081, forcing the aged emperor, Nicephorus III (r. 1078–81), to retire to a monastery. Alexius I Comnenus proved one of the ablest of all Byzantine rulers. By both force and diplomacy he defended the Byzantine Empire against invasion by Scythians, Northmen (qq.v.), Turks, and the armies of the First Crusade (*see* CRUSADES), inaugurating a century of relative stability in the realm. His biography, the *Alexiad*, was written by his daughter, Anna Comnena (q.v.). *See* BYZANTINE EMPIRE.

ALFALFA, common name for a leguminous fodder plant, *Medicago sativa*, known also as lucerne. Alfalfa is believed to have originated in southwestern Asia. Historical accounts indicate that it was first cultivated in Persia (now Iran). From there it was taken to Greece in the 5th century B.C. and to Spain in the 8th century A.D. The Spaniards introduced alfalfa to North and South America. In 1854, when it was taken to San Francisco from Chile, its rapid extension over the irrigated sections of the western States began. Today alfalfa also is grown in many of the nonirrigated sections of the west, and in the east, where early attempts to grow it had failed. As a result of the development of improved varieties and the use of better fertilizing and soil-management practices, the culture of this forage crop has spread throughout the United States.

One of the most nutritious crops grown for fodder, alfalfa is rich in proteins, minerals, and vitamins. Because its root extends as much as 30 ft. into the soil, alfalfa can reach stores of plant food, and, in sections of limited rainfall, can withstand extremes of drought. The plant is remarkably adaptable to various climatic conditions, but it must have certain soil conditions and proper sowing. The effect of alfalfa on irrigated land is to increase the value per acre of subsequent crops. Alfalfa is used as a soiling crop, as pasturage, and in the form of silage and hay, and is fed to dairy cows, beef cattle, sheep, hogs, horses, and poultry. It is also an excellent honey crop for bees, and is used to increase the vitamin content of prepared foods.

The principal alfalfa producing States include California, Washington, Idaho, Kansas, and Oregon. Alfalfa production in the U.S. averages about 66,000,000 tons harvested annually for hay, and about 60,000 tons for seed.

Alfalfa, *Medicago sativa*

John H. Gerard
National Audubon Society

ALFALFA WEEVIL. *See* WEEVIL.

ALFARABIUS. *See* FARABI, AL.

ALFIERI, Conte Vittorio (1749–1803), Italian dramatist and poet, born in Asti, and educated at a military academy in Turin. He inherited a fortune and at the age of seventeen set out on travels throughout Europe. In 1772 he returned to Turin, and in 1775 he wrote a tragic drama, *Cleopatra*, which was enthusiastically received. He then devoted himself to writing tragic dramas and patriotic poems.

Alfieri moved to Florence in 1776 to study the purer Italian spoken in the province of Tuscany; *see* ITALIAN LANGUAGE. While living in Florence he fell in love with Louise de Stolberg (1753–1824), the countess of Albany, who became his mistress. She encouraged his writing and became a stabilizing influence in his hitherto erratic life.

During the next thirteen years he produced nineteen tragic dramas; *Saul* (1783), the most notable, is based on the Biblical account of the destruction of Saul (q.v.) because of his jealousy of David (q.v.). His other tragic dramas of this period include *Agamemnon* (1783), *Philip the*

Second (1781), *Antigone* (1786), and *Sophonisba* (1788) In his most important prose writings of these years, *On Tyranny* (1789) and *The Prince and Literature* (1801), he argued that honest literature could be created only in a free society. In five odes, published from 1776 to 1783, he celebrated American independence.

Alfieri was one of the leading literary and patriotic figures of modern Italian history. The whole body of his writings awakened the national pride of his countrymen and helped to inspire the Italian independence movement known as the risorgimento. *See* ITALIAN LITERATURE: *18th Century*. ITALY: *History: Risorgimento.*

ALFONSO, name of many European kings Short accounts of some of the rulers are included in this article. The more important monarchs are described in separate biographical sketches, to which the reader is referred below. *Alfonso* is the American spelling and *Alphonso* the English one. The name appears in Castilian as *Alfonso*, in Galician (Portuguese) as *Alfonso* or *Affonso*, and in Leonese as *Alonso*. All the forms are derived from the name of Saint Ildefonsus (607–77), who was archbishop of Toledo, Spain.

ARAGON

Alfonso I (d. 1134). *See* ALFONSO I, King of Aragón and Navarre.

Alfonso II (1152–96). He was the son of Ramón Berenguer IV, Count of Barcelona (1131–62), and the brother of Berengaria, Queen of Castile (1108–49). Alfonso became king of Aragón in 1162; in 1164 Aragón and Catalonia were united. A poet and musician, Alfonso is remembered for his patronage of Provençal literature (*see* PROVENÇAL LANGUAGE AND LITERATURE).

Alfonso III (1265–91). He succeeded his father Pedro III (1236–85), becoming king in 1285. During his reign the nobles gained new powers.

Alfonso IV (1299–1336). He inherited the throne in 1327 from his father James II (q.v.), King of Aragón.

Alfonso V (1385–1458). *See* ALFONSO V, King of Aragón and Sicily.

CASTILE

Alfonso I, Alfonso II, and Alfonso III of Castile were, respectively, Alfonso VI, Alfonso VII, and Alfonso VIII of León and Castile. Alfonso X and Alfonso XI of Castile were also Alfonso X and Alfonso XI of León and Castile, respectively. See *León and Castile*, below, and ALFONSO X.

LEÓN AND CASTILE

Alfonso I (693?–757). From 739 to 757 he ruled the provinces of León and Asturias. During his wars against the Moors, he recovered parts of the provinces of Galicia, León, and Santander.

Alfonso II (759?–842) He was king of Asturias from 791 to 842

Alfonso III (848–912). He was crowned king of León and Asturias when, in 866, Asturias was united with León In 910 he abdicated as a result of rebellion on the part of the nobility and members of his own family

Alfonso IV (d 933) King of León and Asturias from 925 to 931, when he abdicated in favor of his brother; the latter became King Ramiro II (923?–50)

Alfonso V (994?–1027) King of León and Asturias from 999. He was killed during a battle against the Moors.

Alfonso VI (1030–1109). See ALFONSO I, King of Castile

Alfonso VII, known as EL EMPERADOR ("The Emperor", 1106?–57). He was also Alfonso II of Castile. He ruled León and Castile from 1126 to 1157. Berengaria, sister of Alfonso II of Aragón (see above), became his wife in 1128

Alfonso VIII (1155–1214) As Alfonso III, he ruled Castile from 1158 to 1214 Although severely defeated by the Moors in 1195 at Alarcos, he continued his attempts to crush the power of the Almohade dynasty. He decisively defeated the Moors at the battle of Las Navas de Tolosa on July 16, 1212

Alfonso IX (d. 1230). As Alfonso VIII, he was king of León from 1188 to 1230. In 1197 he married Berengaria (1171–1246), the daughter of Alfonso VIII of Castile (see above) and the granddaughter of Henry II (q.v.), King of England. Pope Innocent III (*see under* INNOCENT) annulled the marriage in 1214 because of the family relationship of Alfonso and Berengaria. Alfonso founded the University of Salamanca about 1220.

Alfonso X (1221–84). *See* ALFONSO X, called the Learned, King of León and Castile

Alfonso XI (d. 1350). He was king of Castile from 1312 to 1350. A strong defender of the royal prerogative, he courted the lower classes by his economic policies and at the same time curtailed the authority of the nobles. On Oct. 30, 1340, he and Alfonso IV of Portugal (see below) crushed the resurgent Moors in Spain in a battle near the town of Tarifa.

NAPLES

Alfonso I (1385–1458). *See* ALFONSO V, King of Aragón and Sicily.

Alfonso II (1448–95). The grandson of Alfonso I, in 1494 he succeeded his father, Ferdinand I, King of Naples (*see under* FERDINAND: *Naples*). Unpopular, Alfonso abdicated in 1495 and died soon afterward. He was succeeded by his son Ferdinand II (*see under* FERDINAND: *Naples*).

ALFONSO

PORTUGAL

Alfonso I (1112–85). *See* ALFONSO I, King of Portugal.

Alfonso II, called AFFONSO O GORDO ("Alfonso the Fat", 1185–1223). He succeeded his father Sancho I (1154–1211) as king and ruled until his death. In 1217 he defeated the Moors at the village of Alcácer do Sal. He later was excommunicated by Honorius III, Pope from 1216 to 1227, for misuse of church monies. His son Sancho II (1208–48) succeeded him.

Alfonso III (1210–79). The son of Alfonso II, he seized the throne in 1248 after a two-year civil war with his brother Sancho II, who had ruled since 1223. In 1250–51 Alfonso conquered the Moorish kingdom of Algarve for Portugal.

Alfonso IV, called AFFONSO O BRAVO ("Alfonso the Brave", 1290–1357). The grandson of Alfonso III, he succeeded his father Diniz (q.v.) as king in 1325. He ordered the murder of Inés de Castro (1320?–55), the wife of his son Dom Pedro (1320–67). She was a member of the Castilian royal family, and Alfonso IV had her killed because he feared the marriage would hurt Portugal politically.

Alfonso V (1432–81). *See* ALFONSO V, King of Portugal.

Alfonso VI (1643–83). He succeeded his father John IV (*see under* JOHN: *Portugal*), founder of the house of Braganza (q.v.), in 1656. Six years later he expelled the queen regent from his court. Paralyzed from the age of three and unsound in mind, he was deposed in 1667 and exiled to the Azores by his brother Pedro, who acted as regent until Alfonso's death and then became Pedro II (q.v.), King of Portugal.

SPAIN

Alfonso XII, in full FRANCISCO DE ASIS FERNANDO PIO JUAN MARIA GREGORIO PELAYO (1857–85). His mother, Isabella II (q.v.), Queen of Spain, took him with her from Spain when she was deposed as a result of the revolution of 1868. Two years later she formally abdicated in favor of her son but he did not become king until 1875, when the monarchist general Arsenio Martínez de Campos (1831–1900) placed him on the throne. Alfonso suppressed the last of the group of supporters of the descendants of Don Carlos (1788–1855) as pretenders to the throne called the Carlists (q.v.) in 1876 and in the same year ordered the Cortes (q.v.), to draft a new Spanish constitution (see CARLOS). Throughout his reign he was greatly influenced by his prime minister Antonio Cánovas del Castillo (1828–97).

Alfonso XIII (1886–1941). *See* ALFONSO XIII, King of Spain.

ALFONSO I (d. 1134), King of Aragón and Navarre (1104–34). He married Urraca, (1081–1126), daughter of Alfonso VI, King of León who as Alfonso I (q.v.) was King of Castile, thus joining the two principal Christian kingdoms of the time. He won many victories over the Moors and played an important part in the Christian reconquest of Spain. The Moors defeated him at Braga in 1133, and he died the following year of wounds received there.

ALFONSO V, known as ALFONSO THE MAGNANIMOUS (1385–1458), King of Aragón and Sicily (1416–58), and as Alfonso I, King of Naples (1443–58). He was the son of King Ferdinand I (*see under* FERDINAND: *Aragón*). He earned his nickname when, upon his ascension to the throne of Aragón, he destroyed a list containing the names of noblemen who had been hostile to him. He is renowned chiefly for having brought southern Italy under the dominion of Aragón. In 1420 Alfonso attacked Corsica, but speedily hastened to Naples at the request of Joanna II (1371–1435), Queen of Naples, who, in return for his assistance against Louis of Anjou (*see under* LOUIS: *Naples*), named Alfonso her heir. In 1423 the queen transferred her favor from Alfonso to his rival, Louis. On her death in 1435 Alfonso claimed the kingdom, but Duke René of Anjou (1409–80), successor of Louis, opposed him. Rome and Genoa sided with René. The Genoese fleet defeated the fleet of Aragón, and Alfonso was captured. He was sent to Francesco Sforza (see SFORZA), Duke of Milan, who

Alfonso XII, King of Spain in the late 19th century.

Bettmann Archive

set him at liberty and formed an alliance with him. After several battles Alfonso defeated René and entered Naples in triumph. After establishing power, he suppressed the disorders which had sprung up during Joanna's reign

ALFONSO I, known as ALFONSO EL BRAVO (1030–1109), King of Castile (1072–1109), and as Alfonso VI, King of León (1065–1109). His father, Ferdinand I (*see under* FERDINAND: *Castile and León*), King of Castile and León, died in 1065 and left his kingdom, divided into three parts, to his three sons. Alfonso received the kingdom of León, but he succeeded to nearly the whole of his father's dominions as a result of a war with his brothers. In addition, he added Toledo and New Castile to his holdings. In 1086 the Moors defeated him at Zalaca and stopped the gradual reconquest of Spain by the Christian rulers. Alfonso regained some of his power, but in 1108, a year before his death, the Moors defeated him again and killed his only son.

ALFONSO X, called THE LEARNED (1226?–84), King of León and Castile (1252–82), son of Ferdinand III (q.v.), whom he succeeded. His reign was a turbulent one, marked by fighting with the Moors, a series of civil wars, and an extended but unsuccessful attempt on his part to gain the crown of the Holy Roman Empire. He was deposed in 1282, after an insurrection led by his son Sancho IV (1258–95), and died a fugitive at Seville. Alfonso promulgated the law code *Las Siete Partidas,* which in 1501 became the law of the land. He was a poet and author and a leader of Castilian intellectual life. A famous set of planetary tables, still known as the Alphonsine Tables, were prepared under his direction in 1252.

ALFONSO I, in Portuguese, AFFONSO HENRIQUES (1112–85), first King of Portugal (1139–85), and son of Henry of Burgundy (d. 1112), Count of Portugal. As an infant, he inherited his father's title, and at sixteen he removed his mother as regent. Two years later he began what was to be a nine-year struggle for independence from León; he won this war in 1139. On July 25 of that year he also won a decisive victory over the Moors at Qurique, Portugal, and proclaimed himself king of Portugal. With the help of English crusaders en route to the Holy Land, he captured Lisbon, Portugal, from the Moors in October, 1147. His subsequent victories over the Moors included the capture (1171) of Santarém, Portugal.

ALFONSO V, called THE AFRICAN (1432–81), King of Portugal (1438–81), son of Edward (r. 1433–38), King of Portugal, born in Cintra (now Sintra). He succeeded to the throne in 1438, but his powers were delegated to a regency In 1448 he dissolved the regency and assumed control of the government The next year he quelled an insurrection led by his uncle Pedro, who had seized the regency from the queen mother. Between 1458 and 1471 he fought a series of successful wars against the Moors in northwestern Africa He attacked the kingdom of León and Castile in 1476, but was defeated Portuguese exploration of the west coast of Africa, a project begun by Henry (q.v.), known as the Navigator, Prince of Portugal, continued during the reign of Alfonso V.

ALFONSO XIII (1886–1941), King of Spain (1886–1931), posthumous son of King Alfonso XII (*see under* ALFONSO: *Spain*). Until he attained his majority in 1902, his mother, Queen Maria Christina (1858–1929), acted as regent. The principal event of this period was the Spanish-American War (q.v), in which Spain lost the Philippines and all other possessions in the New World. Alfonso's reign was marked by revolutionary, antidynastic uprisings, notably in Madrid and Barcelona from 1909 to 1911 These uprisings took place after the defeat of the Spanish forces by the Moors in Morocco in 1923, when Alfonso appointed Primo de Rivera y Orbaneja (q.v.) as dictator, and after the opening of the National Assembly in 1927. Following a period marked by strikes and riots, Alfonso was forced to flee Spain in 1931; he spent the rest of his life in exile. *See* SPAIN *History.*

ALFRED *or* **AELFRED,** called ALFRED THE GREAT (848–99), King of the West Saxons, a Germanic people, from 871 to 899, born in Wantage, now in Berkshire. He was the youngest of five sons of Ethelwulf (d. 858), King of the West Saxons. On the death of his brother Ethelred (r. 866–71) in 871, Alfred became king, coming to the throne during a Danish invasion. Although Alfred succeeded in making peace with the Danes, five years later their marauding expeditions began again, and by early 878 they were successful almost everywhere. About Easter of 878, however, Alfred established himself at Athelney and began assembling an army. In the middle of the year he defeated the Danes and captured their stronghold, probably at present-day Edington in Wiltshire For the next fourteen years Alfred was able to devote himself to the internal affairs of his kingdom. By 886 he had captured the city of London and soon after he was recognized as the king of all England In 893 the Danes invaded England again, and the next four years were marked by warfare. Eventually, however, the Danes were forced to withdraw from Alfred's domain. The Danish invasions had an important effect on the history of England. By resisting them successfully, Alfred made his kingdom the rallying point for all Saxons, thus laying the foundation for the unification of England.

Alfred was a patron of learning and did much for the education of his people. He established a court school and invited British and foreign scholars, notably the Welsh monk Asser (d. 909?) and the Irish-born philosopher and theologian Johannes Scotus Erigena (q.v.), to come there. Alfred translated such works as the *Consolations of Philosophy* by the Roman statesman and philosopher Anicius Manlius Severinus Boethius (q.v.), *The History of the World* by the Spanish priest Paulus Orosius (fl. 5th cent.), and *Pastoral Care* by Pope Gregory I (*see under* GREGORY). Alfred's laws, the first promulgated in more than a century, were the first that made no distinction between the English and the Welsh peoples.

ALFVÉN, Hannes Olof Gösta (1908-), Swedish physicist, born in Norrköping and educated at the University of Uppsala. He joined the Royal Institute of Technology in 1940 as professor of the theory of electricity; he later taught electronics and plasma physics. Since 1967 Alfvén has divided his time between the institute and the University of California at San Diego, at which he teaches astrophysics for six months each year. He shared the 1970 Nobel Prize in physics with the French physicist Louis Eugène Félix Néel (q.v.). Alfvén was cited for his work on the high-energy electricity-conducting gases known as plasmas. He is considered the founder of magnetohydrodynamics, the study of electricity-conducting gases in a magnetic field, basic to any explanation of the origin of the sun and other stars; *see* ION; IONIZATION.

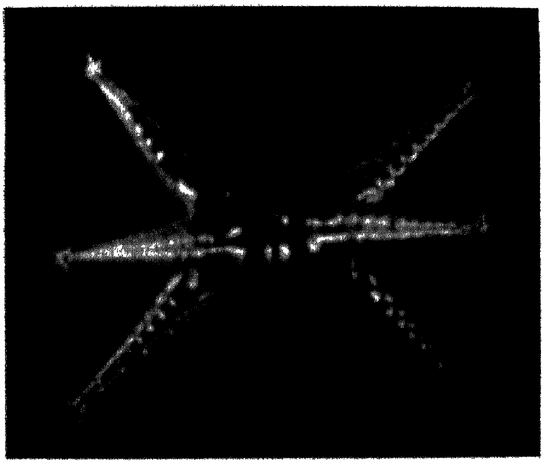
ALGAE, common name for primitive phyla of organisms that are capable of photosynthesis (q.v.) but have little or no differentiation into tissue systems. The best known forms occur as seaweeds and pond scum. Algae are the most ancient form of life capable of photosynthesis; blue-green algae identical to forms living today have been found in fossil deposits 3.1 billion years old in the Fig Tree Formation of South Africa.

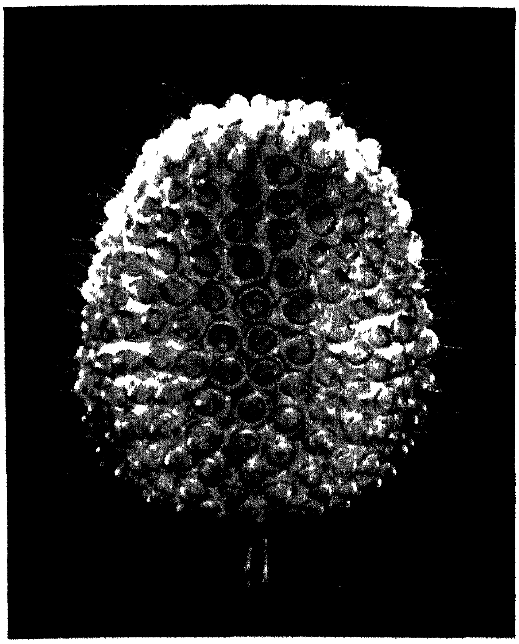
In the classification system followed in this encyclopedia, the blue-green algae are placed in the primitive kingdom Monera, the members of which lack organized nuclei in cells. A recently discovered green alga, a unicellular organism called *Prochloron,* also lacks nuclei. *Prochloron* is therefore not placed with the true green algae but in a new phylum, Prochlorophyta, within the kingdom Monera. One phylum, the Chrysophyta (q.v.), or golden algae, is placed in the kingdom Protista, the members of which have bounded nuclei and specialized cellular structures. The remaining algal phyla—Chlorophyta (q.v.), or green algae; Rhodophyta (q.v.), or red algae; Phaeophyta, or brown algae; and Charophyta, or stoneworts (q.v.)—are part of the plant kingdom (Plantae). The colors of these algae often correspond to their common names and are attributable to specific pigments that are important in algal classification. The Chlorophyta, Charophyta, and Prochlorophyta have two forms of the photosynthetic pigment chlorophyll: chlorophyll a and chlorophyll b. Because the only other organisms in which these chlorophylls occur are such green land plants as mosses, ferns, and flowering plants, it is believed that green algae represent the ancestors of green land plants.

Most algae are aquatic, but some can survive on dry land by means of spores; others can grow on moist soil. More species are found in salt water (where the algae probably evolved) than in fresh water, but fresh waters are often rich in algae. Some algae grow as epiphytes; that is, attached to, but not nutritionally dependent upon, land plants. The widely distributed alga *Protococcus* grows as an epiphyte; it is found as a green mat on tree bark and rocks. Some green algae, including *Protococcus,* live in a symbiotic relationship with fungi. Such combinations are called lichens (q.v.).

Algae are widely distributed, and can live in extreme environments. For example, a few blue-green algae grow in the hot springs in Yellowstone National Park, in water close to the boil-

Model of Staurastrum, *a microscopic green alga found in water supplies.* American Museum of Natural History





A model of the green alga Uroglena, *which produces a fishy taste in water.* American Museum of Natural History

ing point. Certain red algae grow at ocean depths as great as 18 ft.

In size, algae vary from tiny unicellular forms visible only under a microscope to such giant forms as the kelp *Pelagophycus,* which can grow 200 ft. in a year. Microscopic algae that float in the ocean are part of the phytoplankton—the main food source, either directly or indirectly, for most marine animals. *See* PLANKTON.

Man has used algae for centuries as food; principal sources include the brown kelps—known in Japan as kombu—and certain red algae (*Porphyra*) and green algae (*Ulva,* the sea lettuce). Commercially important products include alginates, which are gelatinous extracts of the cell walls of brown algae. Alginates are used in ice cream to give it a creamy texture and to prevent the formation of ice crystals. They are also used in paints to prevent the settling out of pigment particles. The red alga *Gelidium* is a source of agar, which is used in many industries—for example, in making soups, sauces, and jellies—and in bacteriological laboratories, where it is used to solidify media used to grow microorganisms.

Blue-Green Algae. The blue-green algae are found in both salt and fresh waters. They can grow at temperatures higher than those tolerated by any other organism and can endure extreme dryness and high light intensity. The pigment phycocyanin is responsible for the deep green or blue-green color of many species. Blue-green algae occur as single cells, colonies, or filaments. They reproduce by cell division *See* CYANOPHYTA

Closterium, *a one-celled microscopic desmid belonging to the green algae* American Museum of Natural History

Green Algae. The Chlorophyta is the largest of the algal phyla. Green algae are most abundant in fresh water (often visible as pond scums), but also inhabit salt water and terrestrial environments. They may exist as single cells, colonies, filaments, or plates of cells. Most species form motile reproductive cells (zoospores) that develop directly into new plants Various types of sexual reproduction occur, and many species exhibit alternation of generations (q v) *See* CHLOROPHYTA.

Brown Algae. Most species of the phylum Phaeophyta are marine. Known as seaweeds, they grow mainly in the shallow waters of the sea in temperate regions. These are the largest of the algae and the most highly differentiated in structure. Many species form zoospores that in turn form microscopic structures called gametophytes, which produce sperm and eggs The color of brown algae is due to pigments called xanthophylls, which mask the color of the chlorophylls. Common seaweeds are the kelps (*see* KELP), the sea palm, and the sea-otter's cabbage. Most large species are attached to the ocean bottom by a long, thick stalk Gulfweeds of the genus *Sargassum* are found as masses of free-floating algae on the Sargasso Sea of the North Atlantic Ocean. The brown algae are a source of fertilizer, vitamins, iodine, and food.

Red Algae. Most red algae are marine and grow in the deeper waters of subtropical seas. The vegetative body of these organisms is small and delicate. Their color is imparted by the pigment phycoerythrin, which obscures the color of the chlorophylls. Some species secrete lime, which they take from seawater, forming limestone deposits that play an important role in the formation of coral reefs. The so-called Irish moss (*Chondrus crispus*), long used for food, is a red alga that grows off the coasts of Great Britain, Ireland, and North America. *See* RHODOPHYTA. S.C

ALGARDI, Alessandro (1602–54), Italian sculptor and architect, born in Bologna. He studied painting under the Bolognese painter Lodovico Carracci (*see under* CARRACCI), but later turned to sculpture. In 1640 he became head of the Academy of Saint Luke and subsequently executed such marble groups as "Saint Philip Neri and the Angel" for the Church of Santa Maria in Rome and "Beheading of Saint Paul" for the Church of San Paolo in Bologna. Named court sculptor in 1644, he designed the Villa Doria-Pamfili and a large bronze statue of Pope Innocent X for the Pazzo dei Conservatorei, both in Rome. In 1650 he completed the tomb of Pope Leo XI (1535–1605) and a huge bas-relief at the base of the altar of Saint Leo in Saint Peter's basilica, Rome, representing the retreat from Rome of the warrior Attila (q.v.). Algardi is considered one of the foremost Italian sculptors of the baroque (q.v.) school.

ALGARROBA. *See* CAROB.

ALGEBRA, branch of mathematics in which computations are performed with variables, usually designated by letters, which stand for unspecified numbers in the arithmetic operations of addition and multiplication (qq.v.). In modern technology, the word algebra refers to what is commonly called modern or abstract algebra.

In its classic and most common use algebra refers to the study of methods of manipulating algebraic expressions. For instance, the discipline simplifies algebraic expressions, as in the following example:

$$\frac{a^2 - ab}{ab - b^2} - \frac{b}{b - a}$$

the solution of linear equations, $ax + b = 0$, quadratic $ax^2 + bx + c = 0$ and higher-order equations, $a_n x^n + a_{n-1} x^{n-1} + \ldots + a_0 = 0$, and systems of equations

$$\begin{cases} ax + by = c \\ dx + ey = f \end{cases}$$

Also included are the study of negative numbers, complex numbers, ratio and proportion (q.v.), the theory of exponents (*see* EXPONENT), finite arithmetic progression, geometric progression (qq.v.), mathematical induction, the binomial (q.v.) theorem, permutations and combinations (q.v.), the theory of equations (*see* EQUATIONS, THEORY OF), partial fractions, inequalities, and determinants (*see* DETERMINANT). *See* MATHEMATICS, TERMS IN.

An important feature of algebra which distinguishes it from other branches of mathematics such as calculus (q.v.) is that all expressions considered in algebra must contain only a finite number of terms and factors, and the computation must terminate after a finite number of operations. The notion of limit is not an algebraic one, nor are processes in which the limit is involved, for example, derivative, integral, and infinite series.

In modern or abstract algebra, the mathematician deals not with the sums and products of numbers, or letters which stand for numbers, but with sums and products of abstract elements, assuming only that such sums or products obey certain basic laws or axioms. In other words, modern algebra is the study of the structure of systems consisting of a set of elements and a set of operations that satisfy certain axioms. A simple example of such a structure is a group. A group is a set G of elements, denoted by $a, b, c, \ldots$, together with a single operation denoted by a convenient symbol such as an asterisk (*), satisfying the following four axioms.

1) If a and b are elements of the set G, then so is $a * b$. This is called the axiom of closure.
2) If a, b, and c are elements of the set G, then it is true that $(a * b) * c = a * (b * c)$. This axiom asserts that the operation denoted by * is associative, that is, the result does not depend on the order in which the operations are performed.
3) There exists a distinguished element of G, denoted by e, having the property that $a * e = e * a = a$ for any a in G. The element e is called the identity element of G with respect to the operation *.
4) For every element a in G, there exists an element of G denoted by a^{-1}, such that $a^{-1} a = a * a^{-1} = e$. The element a^{-1} is called the inverse of a with respect to the operation *.

The set of integers or whole numbers (q.v.), together with the operation $+$, form a group, and the e of the third axiom is the number 0, and the a^{-1} of the fourth axiom is in fact $-a$.

Many other algebraic systems are also studied under the heading of modern or abstract algebra, for example; semigroups, loops, rings, integral domains, fields, lattices, modules, Boolean algebras, and linear algebras.

Both classical algebra and modern algebra are used extensively in all other branches of mathematics For example, when geometry is studied from an algebraic viewpoint the result is analytic geometry (q.v.) A partial list of other hybrid subjects which have arisen by combining algebra with other branches of mathematics might include algebraic topology, functional analysis, and Lie algebras.

The oldest Western treatise on algebra dates from the 3rd century A D, written by Diophantus (q.v.), a Greek mathematician of Alexandria. Europeans became acquainted with algebra through Latin translations of the Arab mathematicians, chiefly al-Khwarizmi (780–850?), whose work was translated into Latin in the 12th century. The first Renaissance treatise on algebra was written by the Italian mathematician and Minorite friar Luca Paciolo (1450?–1520?) in 1494. The Italian mathematician Scipione del Ferro (1465–1526) derived the solution of one case of cubic equations about 1505, and the Italian mathematician Niccolò Tartaglia (1500?–57) derived the general solution in 1541. The French philosopher and scientist René Descartes (q.v.) applied algebra to geometry in 1637 and was the first to represent the nature of curves by means of equations, thus creating analytic geometry.

Modern algebra began in the early 19th century with the work of the French mathematicians Joseph Louis Lagrange (q.v.) and Évariste Galois (1811–32), the Norwegian mathematician Niels Henrik Abel (q.v.), and many others. Abstract algebra continues to be an area of active research among mathematicians.

ALGEBRAIC SYSTEMS, in mathematics, sets in which the elements can be combined by one or two basic binary operations according to specified rules. The operation of ordinary addition, as in $2 + 3$, acts on two numbers and is therefore called a binary operation. The operation $\sqrt{4} = 2$ acts on only one number and is therefore a unary operation. Arithmetic (q.v.) is the most common algebraic system in which the elements, in this case the ordinary numbers, can be combined by addition and multiplication (qq.v.) using the usual well-known rules. The operations of subtraction and division (qq.v.) are defined in terms of addition and are therefore not considered basic in this context.

Assume that S is a set, infinite or finite, and that $a, b, c, \ldots$ are representative elements; for example, S may be a set in which the elements are the whole numbers, combinable under the usual binary operation of addition In each case it is assumed that S contains at least two distinct elements. Assume also that $*$ and $\circ$ designate two binary operations, the operation $*$ may be thought of as analogous to addition, and $\circ$ to multiplication. The following laws are stated, but no single algebraic system obeys all of them Small letters, representing elements, are members of S.

(1) $a * b$ is a unique element of S

(2) $(a * b) * c = a * (b * c)$.

(3) $a * b = b * a$.

(4) There exist elements z' and z'' of S such that for any element a, $a * z' = z'' * a = a$

(5) Corresponding to an element a, there exist elements a' and a'' of S such that $a * a' = z'$, $a'' * a = z''$

(6) Corresponding to elements a and b, there exists an element c of S such that $a * c = b$.

(7) Corresponding to elements a and b, there exists an element d of S such that $d * a = b$.

(8) $a \circ b$ is a unique element of S

(9) $(a \circ b) \circ c = a \circ (b \circ c)$

(10) $a \circ b = b \circ a$.

(11) There exist elements u' and u'' of S such that for any element a, $a \circ u' = u'' \circ a = a$

(12) Corresponding to any element a not equal to z' or z'' of rule (5), there exist elements $\bar{a}$ and $\bar{\bar{a}}$ such that $a \circ \bar{a} = u'$, $\bar{\bar{a}} \circ a = u''$.

(13) $a \circ (b * c) = (a \circ b) * (a \circ c)$.

(14) $(b * c) \circ a = (b \circ a) * (c \circ a)$.

(15) $a * (b \circ c) = (a * b) \circ (a * c)$.

(16) Corresponding to an element a, there exists an element a_c such that $a * a_c = z'$, $a \circ a_c = u'$. Note the parallels between rules (1), (2), (3), (4), (5), (13) and rules (8), (9), (10), (11), (12), (15).

Algebraic Systems with One Operation. An algebraic system that satisfies rule (1) is called a groupoid or a multiplicative system, although $*$ is sometimes similar to addition; a system that satisfies (1) and (2) is called a semigroup; and one that satisfies (1), (2), and (4) is called a monoid. A quasigroup satisfies (1), (6), and (7); a loop satisfies (1), (4), (6), and (7). A group satisfies (1), (2), (4), and (5), or equivalently (1), (2), (6), and (7). An abelian or commutative group, named for the Norwegian mathematician Niels Henrik Abel (q.v.), satisfies (3).

Groups were invented by the French mathematician Évariste Galois (1811–32) to help in studying polynomial equations (*see* EQUATIONS, THEORY OF); group theory has since become an important and basic tool in almost every branch of pure and applied mathematics.

Algebraic Systems with Two Operations. The ordinary real numbers form what is called a field, which is an algebraic system satisfying (1), (2), (3), (4), (5), (8), (9), (10), (11), (12), and (13) A ring is an algebraic system that satisfies (1), (2), (3), (4), (5), (8), (9), (13), and (14). A commutative ring is one that satisfies (10); a ring with an identity, or unit element, is a ring that satisfies (11). It can be shown that in such a ring, for example, $z' = z'' = z$ or $u' = u'' = u$, z and u are unique. A ring with an identity is a division ring if it satisfies (12). A field, therefore, is a commutative division ring. A commutative ring with an identity is an integral domain, or domain of integrity, if $a \circ b = z$ implies that at least one of a and b is z.

In rings and fields, z, u, $*$ and $\circ$ are usually designated by the more common 0, 1, $+$, and $\times$. The expression $a \circ b$ or $a \times b$ is frequently abbreviated to ab. Rings and fields, like groups, are important in many branches of mathematics.

Boolean algebra (q.v.), an algebraic system that satisfies (1), (2), (3), (4), (8), (9), (10), (11), (13), (15), and (16), is another important algebraic system. It is useful in the study of sets, mathematical logic, computer science, and electric circuitry. In Boolean algebra, $\cup$ and $\cap$ usually replace $*$ and $\circ$. J.Si.

ALGECIRAS, city and seaport of Spain, in Cádiz Province, on Algeciras Bay, about 6 miles W. of Gibraltar. The city is a popular resort area because of the mild winters and nearby beaches and mineral springs. It serves as a port city for the surrounding agricultural region, which produces cereals, tobacco, and livestock. The major industries of the port city are fishing and the processing of cork. The present city was founded on the ruins of a Moorish city in 1704 by Spanish refugees from Gibraltar, when the promontory was captured by a combined British and Dutch force. The ruins of a Moorish aqueduct are still evident nearby. Algeciras was the site of a famous naval battle in 1801, in which the British fleet defeated the combined French and Spanish forces, and of the Algeciras Conference held in 1906 to settle the dispute of the European powers over Morocco. Pop. (1970) 81,662.

ALGER, Horatio (1834–99), American writer of juvenile fiction, born in Revere, Mass., and educated at Harvard and Harvard Divinity School (both now part of Harvard University). He went to Paris in 1860 and for several years worked there as a journalist and tutor. After his return to Massachusetts, he was ordained (1864) a Unitarian minister. In 1866 he settled in New York City, where he became chaplain of a lodging house for newsboys.

In Alger's first volume of fiction, *Ragged Dick* (1867), and in the series of similar works which followed, he portrays underprivileged youths who win fame and wealth by practicing such virtues as honesty, diligence, and perseverance. *Luck and Pluck* and *Tattered Tom*, the first volumes of a second and third series, appeared in 1869 and 1871, respectively. Alger wrote more than one hundred such works, most of which were issued as dime novels. He devoted the profits from the sale of his books, which sold millions of copies, to the improvement of conditions among the street urchins of New York. Although of little literary significance, his novels influenced American youth by emphasizing merit, rather than birth or background, as the chief determinant of success. His other writings include poems, biographies, and additional novels.

Illustrated title page of one of the Luck and Pluck series telling how poor boys achieved wealth and fame through virtue and hard work Bettmann Archive

ALGERIA (Fr. *Algérie*), officially Democratic and Popular Republic of Algeria, republic of North Africa; bounded on the N by the Mediterranean Sea, on the E by Tunisia and Libya, on the S by Niger, Mali, and Mauritania, and on the W. by Morocco. The country lies between about lat. 19° N. and lat. 37° N. and long. 8°30′ W. and long. 12° E. Its total area is 919,353 sq. mi.

THE LAND

Algeria has three main topographical zones. The most arable section of the country is the Tell, a hilly region extending from 50 to 120 mi. inland from the Mediterranean coast The zone to the S and S W of the Tell consists of extensive uplands, mainly spurs and ranges of the Atlas Mountains (q v.). The third zone, occupying more than 90 percent of the country, lies within the Sahara (q v.) Desert Saline lakes are numerous in the N part of Algeria The principal river is the Chéliff, about 450 mi. long.

Climate. The climate of N Algeria, modified by oceanic influences, is humid and relatively cool (averaging about 77° F) in summer, and mild (averaging about 52° F.) in winter In this region, precipitation averages from 20 to 40 in. annually In the Algerian Sahara, summer temperatures average about 95° F., and winter temperatures, which often fall below the freezing point, average about 40° F.

Natural Resources. Most of the wealth of Algeria lies in its mineral deposits, notably crude petroleum, natural gas, and iron ore. The arable land, only about one eighth of the area of the country, is mainly in the coastal regions.

Plants and Animals. Pines, evergreens, and oak trees predominate in Algerian forests; and cork, oak, and cedars are also found in abundance. Extensive tracts of brushwood and esparto grass are found in the hilly areas. The Sahara regions of the country contain the usual desert vegetation, the most important of which is the date palm.

Scavengers, such as jackals, hyenas, and vultures, are found throughout much of the land Most jungle creatures, such as the lion and elephant, have vanished, although the ostrich and monkey can still be found. In some areas, antelope roam freely, stalked by a small number of panthers. Desert fauna include scorpions and a variety of reptiles.

Soils. Rich soils are rare in Algeria. The most fertile lands, located in the Tell region nearest the coast, are relatively poor in humus. The plains have considerable alluvial deposits, but the uplands are more barren and can support only grasses and weeds that are suitable for grazing.

THE PEOPLE

The population consists largely of Berbers or of persons of mixed Arab-Berber stock. Until 1962 about 1,000,000 European settlers, mainly French, lived in Algeria; 90 percent of this group, however, emigrated when Algeria became independent in 1962. The population is chiefly rural, the majority living in villages and on small farms.

Population. The population of Algeria (census 1966) was 12,101,994; the United Nations estimated (1977) 17,910,000. The overall popularion density is about 19 persons per sq mi (1977 U N est)

Political Divisions. Algeria is divided into 13 Wilayas. These are subdivided into 691 local communes.

PRINCIPAL CITIES Algiers (q v) is the capital, chief seaport, and largest city (pop , 1973 est., 1,200,000) Other important cities and towns are Oran (325,000), the trading town, and Constantine (254,000), the center for a livestock- and wheat-producing region

Language and Religion. Arabic is the official language French, however, is still widely read and spoken. The official religion, Islam, is followed by most Algerians More than 150,000 persons are Jewish, and the remainder are mostly Roman Catholic.

Education. Primary education is compulsory for all children under the age of fifteen, and about 80 percent receive primary education The Algerian educational system, long patterned after the French, was changed to a program of Arabization shortly after independence was obtained. The government introduced new teaching methods and began training natives and bringing in foreign, Arabic-speaking teachers. In 1976 all private schools were abolished.

ELEMENTARY AND SECONDARY SCHOOLS. In the mid-1970's, according to the latest available statistics, some 2,640,000 pupils attended primary schools and about 500,000 were enrolled in secondary schools The government also maintains vocational and teacher-training schools.

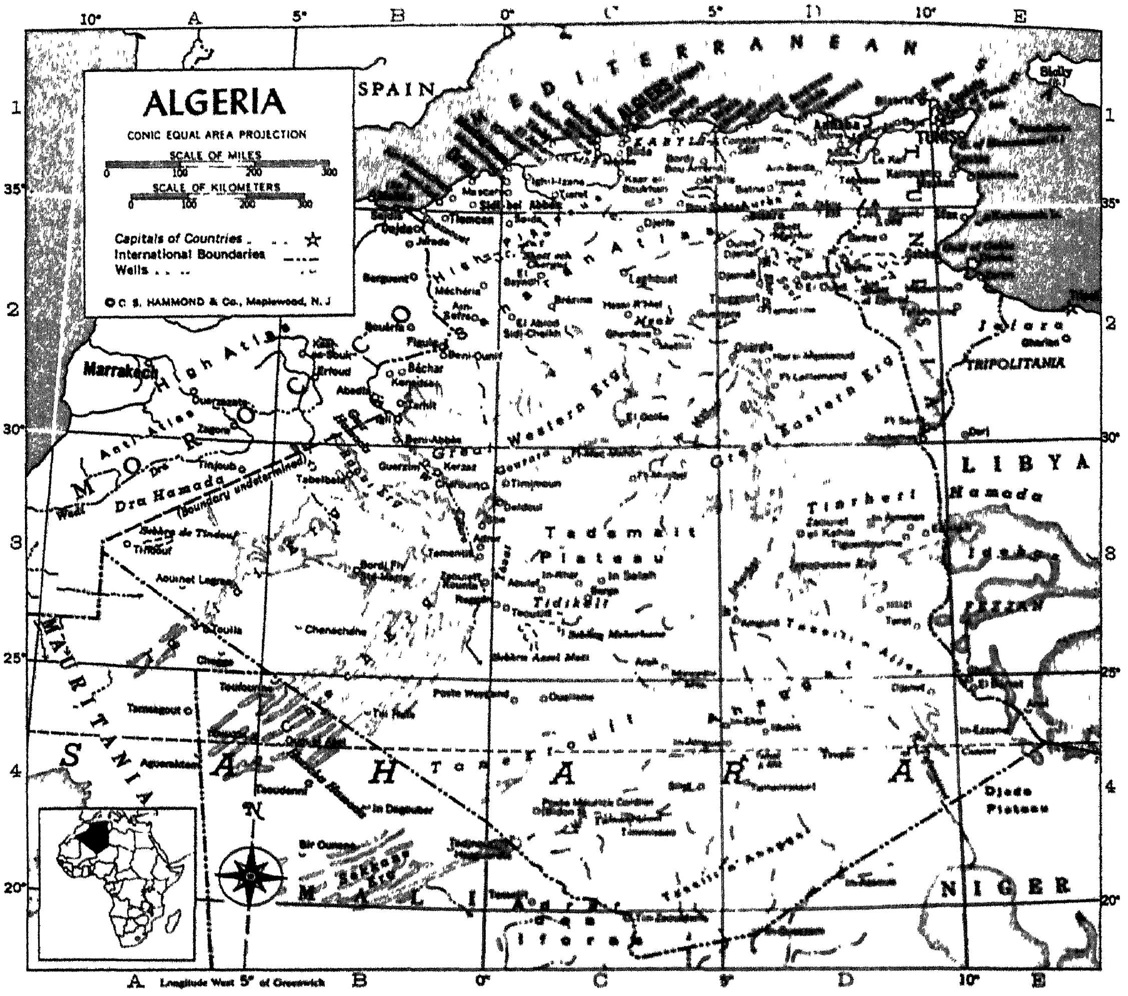
UNIVERSITIES AND COLLEGES. Algeria has four universities, with a total enrollment of about 30,000 students. The University of Algiers, founded in 1879, has, in the mid-1970's, faculties of law, medicine, science, and liberal arts. Algiers Scientific and Technological Institute, in Algiers, Constantine University, in Constantine, and Oran University, in Oran, have all been founded since 1965.

CULTURE

French tradition still dominates the cultural life of Algeria. In the 20th century, however, a movement has grown among the Algerian artists and intellectuals to revive national interest in Arab-Berber origins.

Libraries and Museums. Foremost among Algerian libraries is the National Library in Algiers, which has about 700,000 volumes, including important works on African subjects Collections are maintained by the University of Algiers, which has about 600,000 volumes, and by the Municipal Library in Constantine, which contains about 25,000 volumes.

The Prehistory and Ethnographic Museum,



the National Museum of Antiquities, and the National Museum of Algiers are located in Algiers. The Gustave Mercier Museum in Constantine contains art and archeological collections.

Archeology. Several traces of prehistoric man have been found in Algeria. Frescoes dating from the Neolithic period were discovered in the mountains of the Sahara region of Tassili n' Ajjer. Many relics from Phoenician, Greek, and Roman periods have been unearthed throughout the country.

Literature. Although much Algerian writing was suppressed by the French during the 1950's, the war for independence stimulated a considerable resurgence of interest in national literature. Noted 20th-century Algerian writers are the novelist Kateb Yasin, the playwright Mohamed Dib, and the poet Mark Hadad. The novelist, playwright, and critic Albert Camus (q.v.) was born and educated in Algeria.

THE ECONOMY

Algeria is primarily an agricultural country, with more than 8,000,000 acres of cultivated land, mainly in the plains and valleys near the coast. After independence, large landholdings, including farms previously owned by French settlers, were nationalized. By early 1964 about 6,500,000 acres of farmland were under cooperative management. In the mid-1970's some 2,300,000 persons were gainfully employed, about one half of these in agriculture. Approximately one million Algerians worked abroad, primarily in Europe, and another million were under- or unemployed.

Agriculture. Although half the work force is employed in farming, it accounts for less than 8 percent of the gross national product. The principal crops are wheat, barley, oats, potatoes, citrus fruits, grapes, olives, tobacco, and dates. Of the total livestock raised, more

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Touat (oases)	C 3
Toulla (well)	A 3

than half are sheep, one fourth are goats, and cattle, pigs, and horses account for the remainder

Forest and Fishing Industries State forests cover about 1,400,000 acres Lumber is used for heating and industrial needs Bark is cut for tanning, and cork for commercial purposes Charcoal, made from charred wood, is also used for fuel

Fishing is an important industry, in the mid-1970's the total catch was about 37,000 metric tons The bulk of the yield included sardines, anchovies, sprats, tuna, and shellfish

Mining and Manufacturing. The chief mineral products are crude oil and natural gas from the Sahara Oil production, which had been increasing, stabilized in the mid-1970's at about 47,000,000 metric tons a year

Other major mineral products are iron ore and pyrites, coal, zinc, lead, and copper More than 500,000,000 tons of phosphates are thought to exist in hilly regions of Djebel Onk in the north Almost all mining and industrial activity is state-controlled Most of the industry is centered around the cities of Algiers and Oran Major products are carpets and textiles, chemicals, refined petroleum, natural gas, construction materials, olive oil, wine, and processed tobacco

Currency and Banking The chief monetary unit of Algeria is the dinar (4 03 dinars equal U S $1,1978) All government banking and monetary functions are carried out by the Central Bank of Algeria

Commerce and Trade The principal Algerian exports are petroleum, natural gas, iron ore, phosphates, wine, grain, fruit, alfalfa, cork, and hides Major imports are textiles, sugar, cereals, machinery, iron and steel, coal, and gasoline The United States is Algeria's main trading partner, taking some 43 percent of its exports, including over half its oil Other major partners are West Germany, France, and Italy In the mid-1970's annual exports totaled about $5 2 billion and imports about $5 3 billion

Transportation The rail and road systems mainly serve the northern third of the country Roads link the Sahara oil fields to the coast, and Algeria is involved in the construction of a trans-Saharan highway Air Algeria, the national airline, provides extensive domestic and international air service

Communications Communications facilities include four daily newspapers and national radio and television networks

Left: The Arch of Caracalla at Tebessa.

Trans World Airlines

Below: The Algerian countryside, mountains interlaced with fertile pastures, is typified by this tableau of an Arab shepherd boy with his flocks in a field between Algiers and Bougie.

Trans World Airlines

Right A modern road cut through the rocky, once impassable gorges of Chabet el Akra, near the town of Kerrata, is testimony to Algerian ingenuity and determination

Trans World Airlines

A nomadic tribesman of Algeria, (below) a colorful contrast to the modern native and European population An Algerian pottery maker (below, right) decorates ceramic vases with the aid of a hammer

Emil Brunner

French Embassy Press & Information Div

Labor. About twelve unions, with approximately 300,000 members, are affiliated with the General Union of Algerian Workers, founded in 1956 during the struggle for independence. In 1973, a National Union of Algerian Peasants was formed, consisting of about 700,000 farmer members.

GOVERNMENT

Under the constitution adopted in November, 1976, Algeria is a socialist republic. A National People's Assembly of 261 members was elected to a five-year term in 1977. The National Liberation Front is the sole political party.

Health and Welfare. The government sponsors social welfare programs providing allowances for the aged, needy, and disabled, various benefits for nonagrarian workers; agrarian reform; public works, and accelerated public housing programs.

In the mid-1960's Algeria had over 160 public hospitals and about 1200 physicians. Public health officials are engaged in an effort to eliminate epidemic diseases such as malaria, typhoid, and smallpox. Other health problems are widespread malnutrition and eye ailments.

Local Government. Local laws are enacted by municipal councils, which also elect all administrative officers, including mayors.

Judiciary. The highest court of Algeria is the Supreme Court, which functions both as the high court of appeal and the council of state. Each of the seventeen arrondissements maintains a local court. The three Algerian courts of appeal are located in Algiers, Oran, and Constantine. Numerous justices of the peace and commercial courts complete the judicial system.

Defense. The nucleus of the 80,000-man army was provided by the liberation forces after Algerian independence was secured. A small air force is equipped primarily with Soviet-built jet planes and helicopters. The core of the navy was formed in 1962 with the gift by the Arab Republic of Egypt of two minesweepers.

HISTORY

The coastal portion of North Africa in which present-day Algeria is located was first settled by Phoenician colonists in about the 12th century B.C. Carthage, founded by the Phoenicians in 814 B.C., dominated the entire North African region until its destruction by the Romans in 146 B.C. The Romans gradually extended their suzerainty over most of what is now northern Algeria, organizing most of the territory into the provinces of Mauretania, Caesapiensis, and Numidia. These Roman dominions were overrun (430–31 A.D.) by the Vandals, who were expelled (533–34) by Belisarius (q.v.), the Byzantine general. The region was then made part of the Eastern Roman or Byzantine Empire as the Exarchate of Africa, one of the six military provinces into which the empire was divided.

The Arab Invasion. Arabs invaded North Africa in the 7th century A.D. and made it part of Islam; for several centuries, however, the hinterland remained under the control of the Berbers. In the second half of the 11th century the Almoravids (q.v.) conquered much of Algeria, the region was further unified by the Almohads (q.v.). Almohad power collapsed in 1269, and the region was split into several smaller states.

Late in the 15th century the Christian power of Spain, having conquered the last Moorish state in the peninsula, invaded North Africa and captured Oran, Bone, and Algiers. The Spanish were driven out in the next century by the Turks, who ruled the region through governors sent from Istanbul. Under Turkish sovereignty the country then became known as Algeria (Regency of Algiers).

The Barbary Pirates. The history of Algeria during the next 200 years is a part of the history of the Barbary pirates; see BARBARY COAST. Early in the 18th century Algeria won virtual independence from Turkey. During the early part of the 19th century the increasing activities of the Barbary pirates led to numerous conflicts with other nations. In 1815 a United States fleet under Commodore Stephen Decatur (q.v.) defeated a Barbary fleet and exacted protective treaties from Algeria, Tunis, and Tripoli against the pirates. A combined British and Dutch fleet bombarded Algiers in 1816. Piracy was not wholly suppressed, however, until the French conquest of Algeria, which began with an attack on Algiers in 1830. French rule was resisted by repeated uprisings, notably those led by the Mascaran emir Abd el Kader (1808–83), who was defeated and finally captured in 1847. The next serious rebellion did not occur until 1871–72, and was put down by the French. During the decades that followed, trade was greatly increased, agriculture was diversified, and railroads were built.

The Vichy government (see FRANCE: *History: Vichy Government and Resistance*) held Algeria during World War II until November, 1942, when the country was occupied by an Allied expeditionary force. From June, 1943, to August, 1944, the French Committee of National Liberation, which later formed a provisional government of France, maintained its headquarters in Algiers.

A statute enacted by France in 1947 established a legislative assembly in Algeria and extended French citizenship to all Algerian Muslims. Elections to the Algerian assembly were first held in 1948. Most of the Muslims elected in 1948 and 1949 favored the French administration.

The Rise of Nationalism. Two principal nationalist groups were organized in the late 1940's. One, the Democratic Union of the Algerian Manifesto, was led by Ferhat Abbas (1899–), who had formerly favored Muslim assimilation into the French community. The other group, known as the Movement for the Triumph of Democratic Liberties (M.T.D.L.), favored Arab nationalism. In the 1953 elections the nationalists scored some gains in the large towns. In the following year, however, many Algerians abstained from voting in order to protest French colonial policies, and moderates thus won most of the seats reserved for Muslims.

On Nov. 1, 1954, a nationalist uprising in a mountainous region of eastern Algeria brought French troops into the area to restore order. Shortly afterward, the French government ordered the dissolution of the M.T.D.L., which, at about the same time, changed its name to the National Liberation Front (N.L.F.) and set up a military organization called the National Liberation Army, with headquarters in Cairo, United Arab Republic (U.A.R., now Arab Republic of Egypt).

The cause of the rebels was favored by various African and Asian nations. The principal grievances of the Muslims were economic; their standard of living blatantly contrasted with that of the Europeans living in Algeria. To appease the rebels, the French government initiated reforms aimed at giving farmers a larger share of the crops and at creating additional jobs by encouraging investment in Algeria.

The Franco-Algerian War. The N.L.F., however, continued to engage in acts of terrorism and sabotage, and gained wide-scale support among the native population. So extensive were N.L.F. activities that in early 1957 about 400,000 French troops were engaged in the campaign against the Algerian nationalists. On Jan. 2 the French government reported that during 1956 casualties in Algeria numbered about 18,000 rebel dead and about 3000 French military and civilian dead. In reply to charges of French atrocities, a French government report in December of that year admitted the use of torture, suspicious "disappearances" of those arrested, and arbitrary arrests. On Jan. 31, 1958, the French legislature, spurred by such disclosures, adopted a statute designed to bring about a gradual increase in Algerian self-rule.

The Right-Wing Insurrection. The election in France in May, 1958, of the moderate political leader Pierre Pflimlin (1907–) as French premier precipitated a militarist-colonialist insurrection in Algeria. Prompted by the fear that Pflimlin would open negotiations with the Algerian rebels and sever Algeria from France, a group of French civilians and army officers in Algeria formed the so-called Committee of Public Safety, which declared itself the supreme authority in Algeria. The immediate goal of the committee was to force the return of General Charles de Gaulle (q.v.) to power in France, assuming that he would vigorously prosecute the war against the nationalists. On June 1 de Gaulle resumed power, but soon expressed himself in favor of eventual self-rule for Algeria.

The N.L.F. responded to the return of de Gaulle by intensifying its fight for complete independence, even carrying the fight into metropolitan France. In September the N.L.F. announced the formation of an Algerian government-in-exile with the seat in Cairo, Egypt, and Ferhat Abbas as premier. Many independent Arab governments promptly recognized Abbas and his government.

Later that month, to stabilize government within his own country, de Gaulle submitted a draft constitution of the Fifth French Republic to a referendum, which was held in Algeria, France, and throughout the French Union. About 80 percent of the electorate went to the polls, and, despite threats of reprisal by Algerian nationalist leaders, about 97 percent of the voters favored the constitution.

In October, 1958, de Gaulle outlined a five-year program of economic and social development for Algeria. The program included provisions for new jobs, higher wages, more housing, redistribution of reclaimed land among Muslim farmers, and full political equality of Muslims with Europeans in Algeria. On Oct. 23, de Gaulle invited the leaders of the Algerian government-in-exile to France for negotiations, but the offer was rejected.

In late September, 1960, Abbas traveled to Communist China to discuss plans for Chinese aid. Returning from China, Abbas visited Moscow four days after the tacit recognition of his government by Soviet Premier Nikita S. Khrushchev (q.v.) at the United Nations in New York City on Oct. 2, 1960. The threat of increased rebel dependence on the Communist bloc alarmed Tunisian President Habib Bourguiba (q.v.), who announced his aim of seeking a union of Algeria and Tunisia in order to prevent Communist intervention.

On Nov. 23 the official announcement was made of a referendum on de Gaulle's policies, which was to take place early in January, 1961. When de Gaulle arrived in Algeria on Dec. 9 to urge a "yes" vote on his program, mass demonstrations by Europeans erupted in Oran, Algiers, and smaller cities where he stopped. Counter-demonstrations by Muslims, a general strike by Europeans, and police and army measures left over 110 Muslims and 6 Europeans dead.

Right-wing and rebel leaders called for a boycott of the referendum, which was held Jan. 8, 1961, in metropolitan France and Jan. 6–8 in Algeria. In France, 75.5 percent of those voting supported de Gaulle, and 25.7 percent of the electorate abstained. In Algeria, 69.9 percent of those voting voted "yes", and 42.7 percent of those registered did not vote.

The French government promptly made overtures to the N.L.F. for a conference. Army elements in Algeria which were opposed to governmental policy revolted on April 22 and seized Algiers. De Gaulle, operating under emergency dictatorial powers, suppressed the revolt in five days. Many of his opponents escaped, and were instrumental in forming the Secret Army Organization, called O.A.S. from the initials of its French name (*Organisation de l'Armée Secrète*). The O.A.S. initiated a campaign of terror in France and Algeria directed against government officials, the N.L.F., and the Muslims. The admitted purpose was to incite Algerian Muslims to attack the French population and thus force France to retain control in Algeria in order to protect its nationals.

Independence. The N.L.F. and French officials eventually reached agreement when they met in Évian-les-Bains, France, March 7–18, 1962. Their agreement provided for a cease-fire and a final referendum to permit the Algerian people to decide the question of independence.

Under the proposed terms, Algeria was to have complete sovereignty, with an independent currency and membership in the French-franc monetary area. Its mineral resources were to be developed cooperatively with France. The agreement also called for a provisional Algerian government. Such a body, composed of Muslims and a European minority, was installed in office on April 7.

When the independence referendum was held on July 1, the Algerian electorate voted overwhelmingly for independence and cooperation with France. On July 3, 1962, de Gaulle proclaimed Algeria an independent state, and the provisional government-in-exile arrived in Algiers from Tunis.

Meanwhile, a struggle for power was developing within the Algerian leadership. Ahmed Ben Bella (1919–), although a member of the provisional government, set up rival headquarters in Tlemcen and on July 22 announced the formation of a political bureau headed by himself. The provisional government crumbled, and on Aug. 7 Ben Bella's chief rivals accepted government by his political bureau. Elections were held on Sept. 20. The new assembly, elected from one list of candidates (most of whom were Ben Bella supporters), met on Sept. 25 and chose Abbas, former premier of the Algerian provisional government, as president. Ben Bella was designated premier on Sept. 26. On Oct. 8, Algeria became a member of the United Nations.

During the early months of independence the exodus of French *colons* deprived Algeria of most of its civil servants, its merchants, its private capital, and its taxable income. Land abandoned by the *colons* was occupied by peasants, and in 1963 Ben Bella strengthened the land-reform program already begun by the expropriation of owner-occupied land. He also nationalized several business enterprises. Dissension within the government was climaxed (Aug. 14) by the resignation of President Abbas. On Sept. 8 a draft constitution providing for a single-party presidential system of government was approved by the electorate. Former premier Ben Bella was elected president and took office on Sept. 20. His personal power was consolidated by jailing or exiling most of his opponents.

Meanwhile, foreign investment in Algeria had become virtually nonexistent. Economic aid from Western nations was received mainly from France, but production slumped and the country was beset with food shortages, rising prices, and unemployment. In foreign policy, Ben Bella supported African nationalist movements and pursued a course intended to retain Western economic support while establishing close ties with the Communist bloc. In 1964–65 Algeria received Soviet aid totaling more than $200,000,000 in purchase credits and a loan of $50,000,000 from China. Ben Bella was deposed on June 19, 1965, by a military coup led by Colonel Houari Boumedienne (1927-78), chief of the armed forces, who charged that the dictatorial and reckless use of power by Ben Bella had left Algeria in "anguish". The deposed government was replaced by a revolutionary council of twenty-six members, headed by Boumedienne, who pledged to continue Algeria's socialist course while acting to reassure private interests.

Algeria provided strong vocal backing to the

Arab cause during and after the 1967 and 1973 Arab-Israeli wars Boumedienne also emerged as a leading supporter of national liberation movements, such as the Polisario of Western Sahara, a Spanish territory ceded to Morocco and Mauritania in 1976 Relations with these countries subsequently deteriorated

In 1976 Algeria adopted a new constitution, under which the country was declared a one-party, socialist state and Boumedienne, unopposed, was elected president Two years into his new term, Boumedienne died and was succeeded by Acting Defense Minister Chadli Benjedid (1929-) Among the early acts of the new government (July 4, 1979) was the release from detention of former President Ben Bella

ALGIERS (Fr. *Alger*), capital and largest city in Algeria, on the w. shore of the Bay of Algiers, about 200 miles N.E. of Oran. Algiers is the principal Mediterranean port of N W Africa. The city is divided into two sections. The lower part is the modern city, built by the French, with wide boulevards, theaters, cathedrals, museums, an opera house, and many educational institutions, including the University of Algiers and several Muslim schools. The upper part is the old city, with narrow, twisting streets dominated by the Casbah, a 16th-century fortress built by the Turks, which lends its name to the entire quarter. With the post-World War II increase in population, and the inadequacy of the cramped native quarter, suburbs have burgeoned. Algiers has a leading international air terminal and is the hub of a network of railways and roads. Its strategic position and fine harbor make it a flourishing commercial-shipping center and a major Mediterranean refueling station.

By 1200 B C. the Phoenicians had colonized the site and set up a coastal trading post. Following the Punic Wars ten centuries later, Algiers, then called *Icosium*, became part of the Roman Empire in 146 B C and remained Roman until the middle of the 5th century, when it was overrun by the Vandals. Within a century it was captured by Byzantine forces, who, in turn, were ousted in 650 by Arabs. The present city was founded about 950 by Berbers. During the next five centuries control of the city was gained and lost by various European, Arabian, and Berber warlords. In 1510 the Spanish captured and fortified the islet in front of the harbor, known as the Peñón. In 1518 Algiers proclaimed itself part of the Ottoman Empire, and the Algerians, with the aid of the Turks, drove out the Spanish. While ruled by Turkey the city became the capital of the infamous Barbary Coast (q.v.). For 300 years Barbary pirates preyed upon European, and later United States, shipping In 1815 the American naval captain Stephen Decatur (q v) led an expedition against Algiers and forced the Algerian governor to sign a peace treaty promising to end pirate attacks on U.S ships The piracy continued, however, and in 1816 the combined Dutch and British navies almost completely destroyed the entire Algerian fleet Its powers greatly diminished, Algiers, nonetheless, remained a pirate port until 1830, when France, ostensibly retaliating against attacks on French vessels, captured the city and, in the ensuing eighteen years, the entire country. The French retained control until 1962, when Algeria gained independence During World War II Algiers served as Allied headquarters from 1942 to 1944 in North Africa and was the headquarters of the Free French government of General Charles de Gaulle (q v) Pop. (1970 est.) 1,839,000.

ALGOA BAY, large inlet of the Indian Ocean, at the S E extremity of Africa, in Cape of Good Hope Province, Republic of South Africa, about 400 miles E. of the Cape of Good Hope The bay is of considerable commercial importance On the western side is Port Elizabeth, one of the principal seaports of the Republic of South Africa. Algoa Bay was the landing place of the first British immigrants to South Africa

ALGOL, variable star of the northern heavens, also called β Persei, the second-brightest star in the constellation Perseus (q.v.). It is about 115 light years from the earth, and its light varies over a period of 68 hr., 48 min , and 56 sec. For about 59 hr. the light is almost constant, during the next 5 hr. it decreases to 30 percent of its original strength; it then increases again in 5 more hours. The variation was probably known to the Arabs although the explanation was finally confirmed by the German astrophysicist Hermann Carl Vogel (1841–1907) in 1889 Algol is composed of two stars of unusual brightness about 6,000,000 mi. apart, far too close to be distinguishable with the most powerful telescopes on earth. These two stars revolve around each other, and periodically the brighter is partially eclipsed by the darker. The eclipse is not total because the plane of revolution of the stars is inclined to the line of sight by a little more than 8°. The stars are each about 1,500,000 mi in diameter. The darker star is about 15 percent larger in diameter than its companion, but only about 1/20 as bright. About 300 other variable stars of this type are now known. These are called Algol-type variables, or eclipsing binaries; *see* Double Stars. Their periods vary from 6 hr. to 29 years.

ALGONQUIAN, most populous and widely distributed of the North American Indian linguistic stocks, originally comprising several hundred tribes and speaking nearly fifty related languages. The Algonquian people occupied most of the Canadian region lying to the south of Hudson Bay between the Rocky Mts. and the Atlantic Ocean and, excluding certain territory held by Siouan and Iroquoian tribes (see SIOUX, IROQUOIS), that section of what is now the United States extending northward from North Carolina and Tennessee. In addition, Algonquian tribes inhabited various isolated areas to the south and west, including parts of what are now South Carolina, Iowa, Wyoming, and Montana. The best known Algonquian tribes include the Algonquin (q.v.), from which the stock takes its name, Amalecite, Blackfoot, Cheyenne, Conoy, Cree, Delaware, Fox, Gros Ventre, Kickapoo, Massachuset, Miami, Micmac, Mohegan, Mohican, Montagnais, Musi, Narraganset, Naskapi, Nipmuc, Ojibway, Ottawa, Pequot, Potawatomi, Sac, Shawnee, Tête de Boule, and Wampanoag. Some of the principal Algonquian confederacies were the Abnaki, Pennacook, and Illinois. See AMERICAN INDIAN LANGUAGES; *see also* articles on many of the tribes mentioned.

ALGONQUIN or **ALGONKIN,** North American Indian tribe of the Algonquian (q.v.) linguistic stock, dwelling originally in the vicinity of

Among the first Indians encountered by the Europeans were southeastern members of the Algonquian stock. Drawings of them reached Europe as early as the 1560's after the French and Spanish settlements in Florida were established. This painting of a "Great Lord of Virginia", by a water colorist named John White, is dated 1585 by the Smithsonian Institution. The artist shows the Indian chief painted as he would be for "generall huntings" or solemne feasts.

United States National Museum

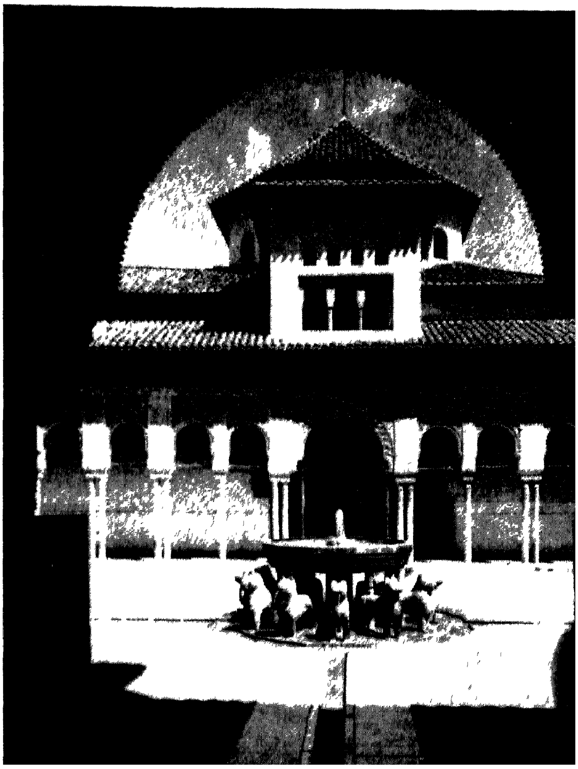
the Gatineau R., in what is now Quebec Province, Canada. French explorers and colonizers in Canada, whom the Algonquins befriended, applied their name to various neighboring tribes. As a result of their alliance with the French the Algonquins became involved in mortal struggle with the Iroquois (q.v.). The warfare ended in complete victory for the latter, and by the middle of the 17th century the remnants of the Algonquin tribe had been dispersed westward. About 2000 Indians of Algonquin ancestry live in present-day Canada, mainly in Ontario and Québec. *See* AMERICAN INDIANS: *Indians of the United States and Canada: Eastern Woodland Area.*

ALGREN, Nelson (1909–), American novelist, born in Detroit. Algren lived most of his life in Chicago and used the slums of that city as background for many of his novels and short stories, beginning with the novels *Somebody in Boots* (1935) and *Never Come Morning* (1942) and continuing with *The Neon Wilderness* (1947), a collection of stories. His brutally realistic story of drug addiction, *The Man with the Golden Arm* (1949), was made into a successful motion picture in 1956. Sordid big-city life also provided the background for the novel *A Walk on the Wild Side* (1956), while the author's outspoken views on a variety of subjects were expressed in *Conversations with Nelson Algren* (1964).

ALHAMBRA, former palace and citadel of the Moorish kings of Granada, situated on a hill above the city of Granada, Spain. Constructed mainly between 1248 and 1354, it occupies a terraced summit about 2500 ft. long and 675 ft. wide. The citadel is surrounded by a red brick wall more than 1 mi. in circumference with thirteen square brick towers. Spanish troops captured the Alhambra from the Moors in November, 1491. Part of the palace was destroyed by the Spanish king and Holy Roman emperor Charles V (q.v.) to make room for a palace in the Renaissance style. The section that remains, however, containing the Court of the Lions, the beautiful Hall of the Two Sisters, and many smaller apartments, has made the Alhambra world famous as an example of Moorish art. *See* ISLAMIC ART AND ARCHITECTURE.

ALHAMBRA, city of California, in Los Angeles Co., 7 miles N.E. of the city of Los Angeles, of which it is a residential and industrial suburb. Manufactures include electrical equipment, petroleum-refinery equipment, and clay products. Pop. (1960) 54,807; (1970) 62,125.

ALI, commonly known as ALI PASHA (1741–1822). *See* ALBANIA: *History: Turkish Rule.*



Court of the Lions at the Alhambra in Granada, Spain.
Trans World Airlines

ALI, in Arabic, 'ALI IBN-ABI-TĀLIB (600?–61), fourth caliph of Islam and son-in-law of the Prophet Muhammad (q.v.); *see* CALIPH. He was born in Mecca (q.v.), the son of Abu Tālib, Muhammad's uncle. Ali was one of the first converts to Islam (q.v.) and one of the bravest and most faithful followers of the Prophet. He married Muhammad's daughter Fatima (q.v.), who bore him two sons, Hasan and Husein. In 632, when Muhammad died, Ali claimed that he, Ali, should succeed him as the leader of Islam. He was preceded in the caliphate, however, by Abu Bakr (q.v.), Omar I (581?–644), and Othman (575?–656), and did not become caliph until 656, when Othman was murdered. In the first year of his reign he was forced to deal with a rebellion led by Aisha (q.v.), whom Muhammad had married after the death of Fatima's mother and who bitterly opposed Ali's claim of succession. Though the rebellion was suppressed in 657, disputes over Ali's right to the caliphate were not resolved. Muawiyah I (*see* CALIPH. *The Immediate Successors*), a member of Othman's family, refused to recognize Ali as caliph and claimed the caliphate himself. This dispute continued until 661, when Ali was murdered at Kufa by a member of the Kharijite sect; Muawiyah I was acknowledged caliph. Dissension between Ali's adherents and his opponents continued to shake the Muslim world. This conflict led to the first and most important schism in Islam, between the Shi'ites (adherents of Ali) and the Sunnites (orthodox Muslims). Ali is the ancestor of the Fatimid line of caliphs, who traced their descent from Ali and Fatima. *See* MUSLIM SECTS.

ALI, Muhammad, original name CASSIUS MARCELLUS CLAY, JR. (1942–), American boxer, born in Louisville, Ky. After winning the light-heavyweight title at the 1960 Olympic Games, he became a professional fighter. At first he attracted as much attention by his extravagant self-praise, usually offered in rhymed couplets, as by his boxing ability. But in 1964, after only twenty professional fights, he upset the American fighter Charles (Sonny) Liston (1934–70) and became world heavyweight champion. Later in 1964, after joining the Black Muslims (q.v.), he assumed the name Muhammad Ali. In 1967 he refused induction into the United States Army on the grounds that he was a Black Muslim minister and a conscientious objector. He was subsequently convicted of draft evasion, and the ruling bodies of boxing declared his title vacant. He returned to the ring in 1970 and won two fights, but lost a championship bout to the American Joe Frazier (1943–) in March, 1971. Later that year, the Supreme Court of the United States overturned Ali's conviction. After winning several bouts, he lost to the American Ken Norton (1945–) in March, 1973. Ali made a comeback in 1974 by defeating Frazier in January, then regained the title by knocking out the champion, the American prizefighter George Foreman (1949–), on Oct. 30, 1974, in Kinshasa, Zaire. Ali fought Frazier again on Oct. 1, 1975, and knocked him out.

ALI BABA, hero of the fairy tale "Ali Baba and the Forty Thieves", which is part of the collection of Oriental stories known as the *Arabian Nights* (q.v.). According to the tale, Ali Baba, a poor forester, accidentally learns a magic formula that opens the door to the cave of robbers. In the absence of the thieves, he repeats the formula, "Open sesame", enters the cave, and loads his donkey with treasure. His brother, Kasim, tries to imitate Ali Baba's success. After entering the cave, however, Kasim forgets the word "sesame" and is slain by the robbers. In an attempt to regain their wealth, the robbers come to Ali Baba's house concealed in oil jars, but they are discovered by an ingenious slave girl, Morgiana, who kills them with boiling oil.

ALI BEY (1728–73), Mameluke ruler of Egypt, born in Abkhasia (now Abkhaz A.S.S.R.), in the Caucasus. In his youth he was carried off to Egypt as a slave. By 1766 he became one of the Mameluke beys, or governors. Gaining followers in the next five years, he slaughtered the other beys, proclaimed Egypt independent of Turkey, and took the title of sultan. He conquered Syria and part of Arabia, but one of his sons-in-law raised an army and defeated him in battle near Cairo in 1773. *See* MAMELUKES.

ALICANTE (anc. *Lucentum),* city and seaport in Spain, and capital of Alicante Province, on the Mediterranean Sea, about 75 miles s. of Valencia. It is in a fertile agricultural region, especially noted for wines. Other important products include olives, almonds, oranges, dates, rice, and barley. Mining of rock salt and calcium phosphate, and fishing and manufacturing are leading industries. The city is the export outlet of the province; its manufactures include textiles, acids, and other products. Pop. (1970) 184,716.

ALICE, city in Texas, and county seat of Jim Wells Co., 40 miles w. of Corpus Christi. It has an oil refinery and meat-packing plants and is the site of livestock auctions. It was settled in 1886. Pop. (1960) 20,861; (1970) 20,121.

ALICE'S ADVENTURES IN WONDERLAND, story for children by the British mathematician and writer Charles Lutwidge Dodgson (q.v.), written under the pen name Lewis Carroll, and published in 1865. The story was originally composed for Dodgson's young friend Alice Liddell (d. 1934), daughter of the dean of Christ Church,

An illustration for Lewis Carroll's Alice's Adventures i *Wonderland by Sir John Tenniel, a famous 19th-cen tury English illustrator.*

Bettmann Archi

Henry George Liddell (1811–98) Upon publication, with illustrations by the British artist Sir John Tenniel (q v), the work immediately became popular as a story for children, the ingenious mixtures of fantasy, realism, and irony make it almost equally appealing to adults In 1871 Dodgson wrote a sequel, *Through the Looking Glass,* which became as popular as the earlier book The two works are often printed as a single volume.

Each story describes the dream of the young Alice In the first dream, told in *Alice's Adventures in Wonderland,* she follows the White Rabbit down a long hole into Wonderland. Here she meets with fantastic adventures at the hands of strange, imaginatively drawn characters Many of these characters have become familiar in everyday speech. Most are taken from the animal world, such as the March Hare, the Mock Turtle, the Cheshire Cat, and the Dodo, others, such as the King, Queen, and Knave of Hearts, are personifications of playing cards. In *Through the Looking Glass* Alice steps through a mirror in her parlor to enter Looking-Glass House She becomes a piece in a game of chess in which all the chessmen are alive and she meets such famous characters as Humpty-Dumpty and Tweedledum and Tweedledee. This book contains the well-known poems "Jabberwocky" and "The Walrus and the Carpenter"

ALIEN, foreign-born resident in a country of which he is not a naturalized citizen. If an alien does not become a citizen by naturalization, he does not possess such political rights as voting and holding public office. In the United States aliens are subject to military and police duty and may be required to contribute to the support of public services; they may acquire, convey, and transmit title to real and personal property. In accordance with the Alien Registration Act of 1940, aliens over fourteen years of age must be registered and fingerprinted. *See* IMMIGRATION· NATIONALITY NATURALIZATION

ALIEN AND SEDITION ACTS, in American political history, four laws passed in 1798. The Naturalization Act, raising from five to fourteen the number of years of residence required for naturalization, was repealed in 1802. The Alien Act, empowering the President to arrest and deport any alien considered dangerous, expired in 1800. The Alien Enemy Act, which expired in 1800, provided for the arrest and deportation of subjects of foreign powers at war with the United States. The Sedition Act, which expired in 1801, made it a criminal offense to print or publish false, malicious, or scandalous statements directed against the government of the United States, the President, or Congress, to foster opposition against the lawful acts of Congress or of the President, or to aid a foreign power in plotting against the U S

The Alien and Sedition Acts were enacted by a Federalist Congress and signed by President John Adams (q v.) The first three were aimed largely at Irish immigrants and French refugees, who had been active in the republican societies hostile to the Adams administration For the most part the three laws were a response to the intense antiforeign sentiment engendered by the XYZ Affair (q v.), which had involved French and American diplomats

The Sedition Act, which elicited the most opposition, was a federalist attempt to stifle political opposition and to check the activities of those Americans who sympathized with the revolutionary government in France Before it expired, about twenty-five people, all members of the Republican Party, were arrested under the terms of the Sedition Act, and about ten were convicted The extreme severity of the statutes, and the partisan spirit that had produced them, caused an immediate and vehement popular reaction throughout the country. This hostility was reflected in such documents as the Kentucky and Virginia Resolutions (q.v.), drafted respectively by Vice-President Thomas Jefferson and James Madison (qq.v.). These resolutions were also important as the first statement in American political history of the principle of nullification (q v.), which later became a basic tenet of the doctrine of States' rights (q.v). The popular opposition to the Alien and Sedition Acts was a major factor in the downfall of the Federalist Party (q.v.). After the expiration of the Sedition Act, it was generally conceded that in attempting to restrict publications Congress had violated the prohibition contained in the First Amendment to the United States Constitution against making laws abridging the freedom of the press.

ALIGARH, city of the Republic of India, in Uttar Pradesh State, and capital of Aligarh District, 43 miles N. of Agra. It is a railroad junction and the commercial center of an agricultural region producing wheat, corn, millet, barley, cotton, and sugarcane. The principal industries in the city include flour milling, the processing of raw cotton, and the manufacture of butter and glass. Among points of interest are the old city of Koil; the ruins of Fort Aligarh, dating from the 16th century and captured from the Marathas (q.v.) by the British in 1803; and Aligarh Muslim University, founded in 1875 as the Muhammadan Anglo-Oriental College. The university is one of the foremost institutions in Asia for the study of Western culture. Pop. (1971) 252,314.

ALIMENTARY CANAL, in anatomy, the principal part of the digestive system. It begins at the mouth and extends to the anus, having, in man, an average length of about 30 ft. Passing through the head, neck, and body, it includes the mouth, pharnyx, esophagus, stomach, small intestines, cecum, and large intestines. *See* DIGESTION

ALIMONY, in law in Great Britain and the United States, an allowance that a woman is entitled to receive from the income or the estate of her husband or former husband during and after an action for separation or divorce (qq.v.). Alimony granted during the course of such an action is known as alimony *pendente lite*, and is designed to enable a wife to carry on litigation against her husband by securing her support while the suit is pending. Such alimony is fixed at the discretion of the court; usually no allowance will be made if the wife has sufficient means of her own. Alimony decreed to a wife as the result of litigation in her favor is known as permanent alimony; if the result of litigation is against the wife, no alimony allowance is made. As in the case of alimony *pendente lite*, the amount of permanent alimony is fixed by the court. Usually paid in the form of a periodic allowance, it varies with the means of the husband and the needs and position of the wife. A decree providing for alimony may be enforced by contempt (q.v.) proceedings and the commitment of a defaulting husband to jail; moreover, in most of the States of the U.S., the court can prevent a husband from leaving the State if it appears that he means thereby to avoid payment. The term alimony may also designate the payments that must be made by a woman to a former husband, although such cases are relatively rare.

ALIPHATIC COMPOUNDS *or* **OPEN-CHAIN COMPOUNDS,** organic chemical compounds consisting essentially of straight or branched chains of carbon atoms.

ALIQUIPPA, borough of Pennsylvania, in Beaver Co., on the Ohio R., about 19 miles NW of Pittsburgh. Steel is the principal product manufactured there. Once a trading center for Iroquois, Shawnee, and Delaware Indians, Aliquippa was named for an Iroquois queen. It was incorporated as a borough in 1894. Pop (1960) 26,369; (1970) 22,277.

AL ITTIHAD. *See* MADINAT ASH SHA'B.

ALKALIES (Ar. *al-qili*, "ashes of the saltwort plant"), originally, the hydroxides and carbonates (q.v.) of potassium and sodium, leached from plant ashes. The term now applies to the corresponding compounds of ammonium, NH_4, and the other alkali metals, and to the hydroxides of calcium, strontium, and barium. All of these substances produce hydroxide ions, OH^-, when dissolved in water. The carbonates and ammonium hydroxide give only moderate concentrations of hydroxide ions and are termed mild alkalies. The hydroxides of sodium and potassium, however, produce hydroxide ions in high enough concentration to destroy flesh; for this reason they are called caustic alkalies. Solutions of alkalies turn red litmus blue, react with and neutralize acids, feel slippery, and are electrical conductors.

Caustic soda, or sodium hydroxide, NaOH, is an important commercial product, used in making soap, rayon, and cellophane (qq.v.); in processing paper pulp, in petroleum refining, and in the manufacture of a large number of other chemical products. Caustic soda is manufactured principally by electrolysis of a common salt solution, with chlorine and hydrogen as important by-products.

Sodium carbonate, Na_2CO_3, one of the mild alkalies, is made chiefly from common salt brines by the Solvay ammonia-soda process (*see* SODA). It is used in the manufacture of glass, as a cleaning agent, and as a water softener.

ALKALINE EARTHS, group of oxides unaffected by heat, that dissolve slightly in water, rendering the solvent somewhat alkaline. They are oxides of the metallic elements, in order of increasing atomic mass, beryllium, magnesium, calcium, strontium, barium, and radium (qq.v.). These metals are referred to as the alkaline-earth elements. All are strongly electropositive. Although the oxides have low solubility in water, they react with and dissolve easily in nearly all solutions of ordinary acids. The sulfates of the lighter elements are soluble but those of the heavier alkaline-earth elements are insoluble.

ALKALOIDS, group of mildly alkaline compounds, mostly of plant origin and of moderate molecular complexity. Even in very small amounts, the alkaloids produce strong physiological effects on the body. All contain nitrogen, and the structure of the nitrogen atoms in the alkaloids is related to the structure of ammonia.

Nearly 3000 alkaloids have been recorded; the first to be prepared synthetically, in 1886, was one of the simplest, called coniine, or 2-propyl piperidine, $C_5H_{10}NC_3H_7$. It is highly poisonous, with less than 0.2 g (0.007 oz.) reported as a fatal dose. Coniine is obtained from seeds of the hemlock (q.v) plant and was the poison that killed the Greek philosopher Socrates (q v.)

Alkaloids produce a wide variety of physiological effects Atropine, obtained from belladonna (q v), is a powerful mydriatic, causing dilatation of the pupils; morphine (q.v.) is a pain-killer; quinine (q v.) is a specific remedy for malaria (q.v.), nicotine (q.v) is a potent insecticide, and reserpine (q.v.) is a valuable tranquilizer Some thirty of the known alkaloids are used in medicine

ALKALOSIS. *See* BLOOD: *Homeostatic Reactions.*

AL-KHWARIZMI (780–850?), Arab mathematician, born in Khwarizm (now Khiva, Uzbek S. S.R.). He was librarian at the court of Caliph al-Mamun (786–833) and astronomer at the Baghdad observatory. His works on algebra, arithmetic, and astronomical tables greatly advanced mathematical thought, and he was the first to use for mathematical purposes the expression *al jabr,* from which the English word algebra is derived. The Latin version, by the Italian translator Gerard of Cremona (1114?–1187), of his treatise on algebra (based on a Hindu work) was responsible for much of the mathematical knowledge of medieval Europe. His work on algorism, a term derived from his name, introduced the method of calculating by use of Arabic numerals and decimal notation.

ALKMAAR, town of the Netherlands, in North Holland Province, on the North Holland Canal, about 20 miles N.W of Amsterdam. It is a trading center for cattle, corn, and dairy products; cheese is a major export, and sailcloth is manufactured there. In 1573 the town successfully withstood a Spanish siege. In October, 1799, during the Napoleonic Wars (q.v.), the commander in chief of the Anglo-Russian army in the Netherlands signed the French terms of capitulation in Alkmaar. Pop. (1972) 50,728.

AL KUWAIT *or* **KUWAIT,** capital of the sheikdom of Kuwait (q.v.) and port on Al Kuwait Bay, on the N.W. coast of the Persian Gulf, 80 miles S.E. of Basra, Iraq. Rich oil fields in the coastal desert and in the gulf have provided revenue for making the city one of the most modern in the Middle East. An important oil port, Al Kuwait produces petrochemicals and other petroleum products and is a center for the production of hides and skins, carpets, handicrafts, boats, wood and metal products, bricks, cement, chemicals, flour, wool, and frozen fish. Shrimp and pearls are obtained from the Persian Gulf. The city is the site of Kuwait University; vocational-training, technical, and teachers' colleges; and a state museum. Founded in the early 18th century, Al Kuwait was once considered as terminus for a projected Berlin-Baghdad Railway The name is also spelled Al-Kuwayt, Kuweit, or Koweit Pop. (1970) 80,405

ALKYD, term for the macromolecular ester formed by the reaction of a polyhydric alcohol, the molecules of which contain two or more –OH groups, with a polybasic acid, the molecules of which contain two or more –COOH groups The alkyds, or alkyd resins (q v) are very widely used in the protective-coatings industry *See* CHEMICAL COMPOUNDS, SYNTHETIC

ALLAH, Muslim name for the Supreme Being The term is a contraction of the Arabic *al-Ilāh,* "the God" Both the idea and the word existed in pre-Islamic Arabian tradition, in which some evidence of a primitive monotheism can also be found Although they recognized other, lesser gods, the Arab heathens recognized Allah as the supreme God and turned to Him in times of trouble

The Koran (q v), the holy book of Islam (q v), asserts that Allah is the Creator and the One who rewards and punishes, that He is unique and can only be one; that He is eternal, omniscient, omnipotent, and all-merciful The core of the religion is submission to the will of Allah, man must abandon himself entirely to God's sovereignty.

Although as Creator Allah is utterly transcendent and not to be compared to any of his creatures, He is nevertheless a personal god, a fair judge, merciful and benevolent Each chapter of the Koran begins with "Allah, the Merciful, the Compassionate", and before fulfilling religious obligations the Muslim recites "in the name of Allah, the Merciful, the Compassionate".

Islam does not admit of any mediator between God and man, man approaches Allah directly in personal prayer and in reciting the Koran, considered to be literally the speech of Allah. The prophets, who conveyed the word of Allah, are not considered in any way divine.

ALLAHABAD, city of the Republic of India, in Uttar Pradesh State, and capital of the Allahabad District, at the confluence of the Jumna and Ganges rivers, about 350 miles S E of New Delhi. An important railroad junction, Allahabad is a trading center for agricultural products, notably rice, pulse, wheat, tobacco, cotton, and sugarcane. Known originally as Prag, it is one of the oldest and holiest cities in India, visited annually by hundreds of thousands of Hindu pilgrims. The Mogul emperor Akbar (q.v.) gave the city the present name in 1575. Points of interest include a stone pillar dating from the reign of the Indian king Asoka (q.v.), a fort and the ruins of a palace, both built by Akbar, and the Jama Masjid (Great Mosque). The city is the site of the University of Allahabad, an institute for teachers, and several technical schools. Allahabad was formerly the capital of the United Provinces of Agra and Oudh, now Uttar Pradesh State. The ashes of the assassinated Indian leader Mohandas Karamchand Gandhi (q.v.) were consigned to the sacred Ganges at Allahabad in 1948. Pop. (1971) 490,622.

ALL-AMERICAN CANAL. *See* IMPERIAL VALLEY.

ALLANTOIS. *See* EMBRYOLOGY: *Extra-embryonic Membranes.*

ALLEGHENY, river of Pennsylvania and New York, rising in Potter Co., Pa., nearly 2000 ft. above sea level, and merging with the Monongahela R. at Pittsburgh, Pa., to form the Ohio R. Although the river flows through a hilly region, it is navigable for small boats for nearly 200 mi. above Pittsburgh. Unusually heavy flooding has necessitated the building of several reservoirs. The Allegheny is about 325 mi. long and drains an area of about 11,000 sq.mi.

ALLEGHENY MOUNTAINS, *or* THE ALLEGHENIES, complex of ranges and uplands of the Appalachian system (*see* APPALACHIAN MOUNTAINS). The name is usually applied to the ranges W. of the Blue Ridge (q.v.) in Pennsylvania, Maryland, Virginia, and West Virginia. Varying from 2000 ft. to more than 4500 ft. in height, the range is composed of stratified rocks of the Silurian, Devonian, and Carboniferous ages, and is rich in timber and minerals (*see* SILURIAN AGE; DEVONIAN SYSTEM; CARBONIFEROUS SYSTEMS).

ALLEGORY, fictional literary narrative or artistic expression that conveys a symbolic meaning parallel to but distinct from, and more important than, the literal meaning. The Greek philosopher Aristotle and the Roman rhetorician Quintilian (qq.v.) defined allegory as an extended metaphor. The symbolic meaning is usually expressed through personifications and other symbols. In literature both the fable and the parable (qq.v.) are didactic, comparatively short and simple allegories. Allegory is used in the Bible, notably, in the parables of the New Testament; and some theologians have interpreted the Old Testament allegorically. Although little fully developed allegory is found in ancient Greek or Latin literature, the 4th century B.C. Greek philosopher Plato (q.v.) used it in *The Republic.* The poem *Psychomachia* by the 4th century A.D. Latin poet Aurelius Clemens Prudentius (q.v.) is usually considered the first Christian allegory.

The art of allegory reached its height during the Middle Ages and the Renaissance, and allegory remained a popular literary form until the end of the 17th century. The best examples include the *Romance of the Rose* by the French poets Guillaume de Lorris (q.v.) and Jean de Meung (d. 1305?), *Piers Plowman* (late 14th cent. attributed to the English poet William Langland (q.v.), *The Pilgrim's Progress* by the 17th century English writer John Bunyan (q.v.), *The Faerie Queene* by the late-16th-century English poet Edmund Spenser (q.v.); the medieval morality play (q.v.), and *Gulliver's Travels* by the British satirist Jonathan Swift (q.v.). Allegory was also employed by the Italian poet Dante Alighieri and by the English writers Geoffrey Chaucer, John Dryden (qq.v.), and Lewis Carroll (see DODGSON, CHARLES). *Animal Farm* by the 20th-century British author George Orwell (q.v.) is an allegory, and some contemporary drama and dance, particularly modern dance, has allegorical elements. *See* ENGLISH LITERATURE: *Middle English Period: Allegory.*

In art, an allegorical painting or piece of sculpture is one that might be interpreted to mean more than the visual depiction, as in the 15th century painting, "Primavera" by the Italian artist Sandro Botticelli (q.v.), in which representational figures from classical mythology also symbolize spring.

Allegory is also considered a figure of speech; see SPEECH, FIGURES OF.

ALLELE. *See* HEREDITY: *Physical Basis of Heredity.*

ALLEN, name of two American brothers who were members of the Green Mountain Boys (q.v.) and fought in the American Revolution (q.v.) against the British.

Ethan Allen (1738–89), American Revolutionary patriot, born in Litchfield, Conn. In 1769 he moved to the region known as the New Hampshire Grants, comprising present-day Vermont. After settling in Bennington, he became prominently involved in the struggle between New York and New Hampshire for control of the region. Following rejection by the New York authorities of an appeal that the region be established as a separate province, Allen organized a volunteer militia, called the Green Mountain Boys, to resist and evict proponents of the New York cause. He was thereupon declared an outlaw by the royal governor of New York. At the outbreak of the American Revolution, Allen and his force offered their services against the British. Acting on orders from the Connecticut legislature, he, the Connecticut soldier Benedict Arnold (q.v.), and a contingent of the Green Mountain Boys surprised and captured Fort Ticonderoga early in the morning of May 10, 1775.

The statue of Ethan Allen, who fought for the independence of Vermont, stands outside the Statehouse in Montpelier, the State capital. Vermont Development Dept

Allen demanded surrender from the British commander "in the name of the Great Jehovah and the Continental Congress". Subsequently, as a member of the army of General John Philip Scuyler (q.v.), he rendered valuable service in the American military expedition sent against Canada. He was taken prisoner near Montreal in September, 1775, and held in confinement until exchanged in 1778. Following his release by the British he returned to his home and was commissioned a lieutenant colonel in the Continental Army and major general of militia.

In 1778 Allen appeared before the Continental Congress in behalf of a claim by Vermont for recognition as an independent State. With his brother Ira and other Vermonters he devoted most of his time thereafter to the territorial dispute He negotiated with the governor of Canada between 1780 and 1783, ostensibly for the purpose of establishing Vermont as a British province. On the basis of this activity Allen was charged with treason, but, because the negotiations were demonstrably intended to force favorable action on the Vermont case by the Continental Congress, the charge was never substantiated. He wrote a *Narrative of Colonel Ethan Allen's Captivity* (1779).

Ira Allen (1751–1814), soldier in the American Revolution, born in Cornwall, Conn. In 1772 he moved to Vermont and joined the Green Mountain Boys in support of his brother Ethan. He was active (1780–91) in obtaining statehood for Vermont and largely responsible for the founding (1789) of the University of Vermont He was also the author of *The Natural and Political History of Vermont* (1798)

ALLEN, Florence Ellinwood (1884–1966), American jurist, born in Salt Lake City, Utah, and educated at Salt Lake College, Western Reserve University, the University of Chicago, and New York University After a brief career as a music editor and lecturer she began to practice law in Cleveland in 1914. Elected judge of the Supreme Court of Ohio, she served from 1922 to 1934, the first woman in America to hold such office. She gained national recognition during this time by her decision upholding the city-manager plan of government (*see* LOCAL GOVERNMENT). Franklin Delano Roosevelt (q v), President of the United States, appointed her judge of the U.S Court of Appeals for the Sixth Circuit in 1934 She retired in 1959 She is the author of *This Constitution of Ours* (1940) and *The Treaty As an Instrument of Legislation* (1952).

ALLEN, Fred, professional name of JOHN FLORENCE SULLIVAN (1894–1956), stage, screen, and radio comedian, born in Cambridge, Mass., and educated at Boston University After a long career in vaudeville (q.v.), he appeared in many Broadway productions, including *The Passing Show of 1922* and *The Greenwich Village Follies.* Among the motion pictures in which he acted were *Thanks a Million; Sally, Irene, and Mary, Love Thy Neighbor;* and *We're Not Married.* His first radio performance was in 1932, and from 1939 to 1949 he was producer, chief writer, and star of the popular radio program, the *Fred Allen Show.* In 1950 he made his formal television debut and from 1953 to 1954 he was star of the program *Judge for Yourself.* He wrote an account of his radio career, *Treadmill to Oblivion* (1954)

ALLEN, Frederick Lewis (1890–1954), American editor, author, and social historian, born in Boston, Mass. After attending Harvard University (A B, 1912), where he began his literary career as editor of the *Harvard Advocate,* he was assistant editor of the *Atlantic Monthly* and, later, managing editor of the *Century* During World War I he served on the Council of National Defense, and from 1919 to 1923 he was secretary of the Corporation of Harvard University. Resuming his editorial career in 1923, he joined the staff of *Harper's Magazine* and eventually became the magazine's editor in chief (1941–53).

Allen had begun to contribute light magazine pieces soon after leaving college. In 1931 his first book, *Only Yesterday*, an informal social history of the United States in the 1920's, met with wide success; *Since Yesterday* (1940) was a similar treatment of the 1930's. Both are credited with having caught the unique flavor of these decades tersely and entertainingly. His other works include *The Lords of Creation* (1935) and *The Great Pierpont Morgan* (1949).

ALLEN, Richard (1760–1831), Negro American clergyman, born in Philadelphia, Pa. A son of a slave, Allen was freed after his master had been converted to Methodism. Allen was ordained a minister in 1784 at the first conference of the Methodist Church in America. During the next two years he was an itinerant preacher. While preaching at St. George's Church in Philadelphia in 1786, an incident of racial prejudice occurred, which is believed to have caused him to begin working for the establishment of an independent Methodist church for Negro members. This separate church was formed in 1799. In 1816 the African Methodist Episcopal Church (q.v.) was formed, uniting the Negro congregations of New York, New Jersey, Delaware, and Maryland. Allen was appointed its first bishop, a post he held until his death.

ALLEN, (William) Hervey (1889–1949), American writer, born in Pittsburgh, Pa., and educated at the United States Naval Academy, the University of Pittsburgh, and Harvard University. From 1924 to 1925 he taught English at Columbia University, and from 1926 to 1927 lectured on American literature at Vassar College. Allen's first important work was *Israfel* (1926), a biography of the American author Edgar Allan Poe (q.v.). He gained wide popular recognition with *Anthony Adverse* (1933), a long, factually accurate historical novel about the Napoleonic period. The book sold over one and a half million copies in the United States and millions more in Europe.

ALLEN, Zachariah (1795–1882), American inventor, born in Providence, R.I., and educated at Brown University. He invented the first hot-air furnace for household use in 1821, and three years later he went to Europe to study mechanical methods. He developed an automatic cut-off valve for steam engines and made improvements on existing inventions. Allen promoted the development of manufacturing industries in Rhode Island and was active in securing legislation to regulate the sale of explosive oils. His works include *Science of Mechanics* (1829), *Philosophy of the Mechanics of Nature* (1851), and *Solar Light and Heat: The Source and Supply* (1879).

ALLENBY, Edmund Henry Hynman, 1st Viscount Allenby (1861–1936), British field marshal, born in Felixstowe, England, and educated at Haileybury College and at the Royal Military Academy, Sandhurst. Between 1884 and 1902 he was stationed with the Inniskilling Dragoons in Bechuanaland and Zululand, and served in the South African War (q.v.). He had held various cavalry commands before becoming inspector of cavalry in 1910. During World War I he headed the British cavalry in France. He was given command of the Fifth Army Corps in 1915. Subsequently, as head of the Third Army, he figured prominently in the second battle of Ypres and in the capture of Vimy Ridge (see YPRES, BATTLE OF, VIMY). As a result, he was promoted to the rank of general and made a Knight Commander of the Bath.

Assigned in 1917 as commander in chief of the Egyptian Expeditionary Force, he led a victorious offensive against the Turkish armies in the Middle East, capturing Jerusalem on Dec. 10, 1917, winning a decisive victory at Megiddo in September of 1918, and taking Damascus on Oct. 1, 1918. The campaign forced the Turks to capitulate. In recognition of his services he was promoted to the rank of field marshal and made a viscount. From 1919 to 1925 he was British

Viscount Allenby and his wife

UPI

high commissioner in Egypt He became lord rector of the University of Edinburgh in April, 1936.

ALLEN PARK, city of Michigan, in Wayne Co, 5 miles S.W. of Detroit, of which it is a residential suburb. Manufactures include copper and aluminum tubing and hospital supplies Pop (1960) 37,494, (1970) 40,747

ALLENTOWN, city in Pennsylvania, and county seat of Lehigh Co., on the Lehigh R, about 54 miles N.W of Philadelphia. It is an important industrial and commercial center. The principal manufactures are cement, motor trucks and buses, steel and steel products, clothing, textiles, paper, leather, and chemicals. Agricultural products raised in the surrounding region, popularly known as the Pennsylvania Dutch country, include wheat, corn, and potatoes. Allentown is the site of Muhlenberg College and Cedar Crest College. Other places of interest include the Zion Reformed Church that served as the hiding place for the Liberty Bell (q.v.) during the Revolutionary War, the museum of the Lehigh Valley Historical Society, the airport, the public parks, and the State Hospital. The 3000-acre Trexler-Lehigh County Game Preserve, 10 miles N of the city, contains large herds of buffalo, elk, and deer.

Chief Justice of the Pennsylvania Supreme Court William Allen (1704–80) purchased the site of present-day Allentown in 1735. About 1762 he founded there a community that became known as Allentown. Many of the early settlers were of German extraction. During the Revolutionary War the town was an important munitions-supply point for the Continental Army. It was incorporated as Northampton Borough in 1811, but in 1838 the original name was restored. Allentown was chartered in 1867. Pop. (1960) 108,347; (1970) 109,527.

ALLEPPEY, city and seaport of the Republic of India, in Kerala State, on the Indian Ocean about 130 miles S.E. of Kozhikode. Trade with Cochin in the N. and Trivandrum in the S. is facilitated by canals and lagoons along the coast. Copra, pepper, and ginger are major exports. Pop. (1971) 160,064.

ALLERGY, a condition of hypersensitivity in certain persons or animals to substances harmless to most individuals. Some people have characterized allergy as immunity (q.v.) "gone wrong". In the immune reaction contact with a disease-producing micro-organism or a toxin prompts an. individual to build up antibodies (proteins related to globulin serum) against the offending organism or toxin so that he will be protected against further exposure. All normal people are able to produce such protective antibodies In a few people, however, the capacity to differentiate potentially harmful substances from harmless ones is lost These persons produce antibodies against one or many inoffensive substances, and thus are said to be allergic. When an antibody reacts with an antigen (a substance that stimulates the formation of antibodies) in such a person, he has an allergic reaction. The symptoms of that reaction will depend on where it takes place If it occurs in the nose it may cause sneezing and running of the nose, giving rise to hay fever (q v) In the air passages it may cause contraction, leading to wheezing, coughing and difficulty in breathing, as in asthma In the skin, it may produce itching spots, hives or welts (urticaria). If the reaction takes place in the circulating blood, a severe reaction known as serum sickness may ensue The *allergen,* or the substance producing the reaction, is usually a protein or protein-carbohydrate complex. It may be inhaled, as dust or pollen; it may be eaten, as eggs or shellfish; it may be injected, as penicillin; or it may act by mere contact, as wool, adhesive tape, or metal

The variety of substances to which a person may be allergic is almost infinite; diagnosis involves discovering the particular substance or substances to which the patient is hypersensitive (reacting excessively) A careful history of the development of the allergic reaction may give a clue, particularly when it is seasonal, or associated with an exposure to a specific substance, or when it occurs only in a particular place. Often the patient can remain unaffected merely by avoiding the particular allergen to which he reacts allergically but common allergens such as dust or pollen cannot easily be avoided.

An allergic individual may develop new hypersensitivities, or old hypersensitivities may die out. Allergies usually first appear in childhood, adolescence, or early adulthood, but may develop for the first time later in life Sometimes psychic factors, stemming from emotional conflicts, play an important role in allergy. An allergic individual may be symptom-free despite exposure to the allergen during periods of emotional tranquillity. Conversely, emotional upsets may bring on the allergic attack. *See* PSYCHOSOMATIC MEDICINE.

The mechanism of allergic reactions is not fully understood. Most likely the antigen is associated with a particular tissue, such as the cells lining the nasal passages or the bronchial tubes The antibody reacts with the antigen at these sites, causing the release of certain chemical substances, including histamine (q.v.), which mediates or brings about the reaction. The diagnosis of an allergic problem in a patient is made from his history, which often gives a clue as to the underlying allergen. Sometimes allergy testing employing skin tests with a wide variety of common allergens may be needed to pin point the specific allergen or allergens causing difficulties.

The treatment of an allergy depends on how troublesome it is. The simplest and best treatment, when possible, is to avoid contact with the allergen. A person allergic to horse dander, feathers, particular pollens, or particular foods or medicines, for example, may avoid them. Where this is not feasible either because the allergen is unknown, or because it affects more than one part of the body or when there are too many allergens, the use of drugs to decrease the reaction, such as antihistamines or, in more serious cases, adrenal cortical steroids may be administered. In other cases desensitization (the process of making the patient able to tolerate the antigen without having a reaction) may be accomplished by giving injections of antigen, first in very minute doses, and then in gradually increasing doses as tolerance builds up. Skin testing is always needed when desensitization treatment is being considered. Symptomatic treatment, such as the administration of drugs to relax spasm in the walls of the bronchi in asthmatics, decongestants for hay fever sufferers, or local ointments to relieve itching for hives may also be useful. *See* Asthma, Bronchial; Hives, Ivy Poisoning L.J.V.

ALL FOOLS' DAY, the first day of April (q.v.).

ALLHALLOWS. *See* All Saints' Day.

ALLHALLOWS EVE. *See* Halloween

ALLIANCE. *See* Treaty; Holy Alliance; Confederation; Triple Alliance; Triple Entente.

ALLIANCE, city of Ohio, in Stark Co., on the Mahoning R., 50 miles S.E. of Cleveland. It is an industrial center, manufacturing many different products, including aluminum, traveling cranes, steel forgings, insulation, fertilizers, and electrical appliances. It is the site of Mount Union College (1846). Settled by Quakers in 1805, Alliance was incorporated as a village in 1854 and as a city in 1889. Pop. (1960) 28,362; (1970) 26,547.

ALLIANCE FOR PROGRESS, program for technical and financial cooperation and development among the American nations of the Organization of American States (q.v.), known as O.A.S. The alliance was established by the Charter of Punta del Este, signed on Aug. 17, 1961, at the suggestion of President John F. Kennedy (q.v.) of the United States. The U.S. was a charter member of the alliance and agreed to provide assistance for the development goals to be carried out within the framework of the O.A.S. to benefit especially underdeveloped countries of Latin America. Each nation submits national development plans to the O.A.S.

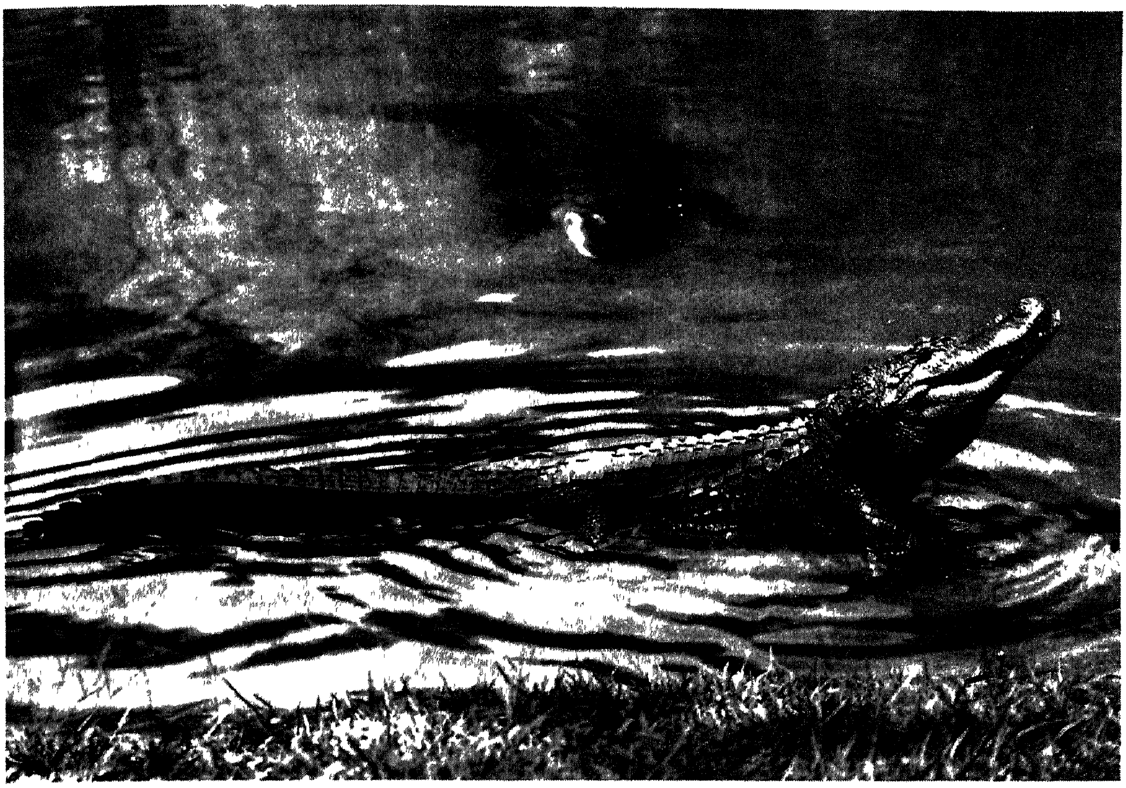
The economic objectives include raising national incomes and distributing them more equitably, accelerating industrialization and agricultural productivity, and stabilizing prices and increasing exports. Social objectives include improvements in education and reduction of illiteracy, improving health and nutrition and increasing trained medical personnel.

After ten years in operation the programs had mixed results. Per capita economic growth—3.8 percent—exceeded the goal of 2.5 percent. Agrarian reform did not improve, housing shortages continued, unemployment worsened because of high birth rates (*see* Population Study), and the international trade outlook remained bleak.

Between 1962 and 1971 the U.S. contributed $11,000,000,000 in financial and technical aid. Additional aid was extended by the Inter-American Development Bank, the International Bank for Reconstruction and Development (q.v.), and other international agencies. *See also* Inter-American Cooperation.

ALLIBONE, Samuel Austin (1816–89), American bibliographer and librarian, born in Philadelphia, Pa. Allibone was editor of publications and corresponding secretary of the American Sunday School Union from 1867 to 1873 and from 1877 to 1879. From 1879 to 1888 he was head librarian of the Lenox Library (now part of the New York Public Library) in New York City. He is best remembered as the compiler of *A Critical Dictionary of English Literature and of British and American Authors* (3 vol., 1854–71).

ALLIGATOR (Sp. *el lagarto,* "the lizard"), common name for crocodilians of the genus *Alligator,* sometimes also applied to closely related species of the genus *Caiman.* Only two species are included in the genus *Alligator, A. mississipiensis,* confined to southeastern U.S., and *A. sinensis,* confined to the basin of the Yangtze River in China. Adult American alligators are from 6 to 20 ft. long, whereas the Chinese alligator seldom exceeds 5 ft. in length. The snout is broad, flattened, and rounded; the nostrils are separated by a prolongation of the nasal bone; the feet are webbed to about the middle; and the bony plates of the back are not articulated together, and there are none on the ventral surface. Each of the upper and lower jaws



American alligator, Alligator mississipiensis, *found in rivers and swamps of southeastern United States*
John Gerard – National Audubon Society

has about twenty teeth. The eggs are laid on shore in a nest of leaves and mud and are hatched by the sun's heat. As many as sixty may be laid in one nest. Alligators feed on fish, frogs, snakes, turtles, birds, mammals, and carrion In the wild state they are dangerous to man chiefly when disturbed or wounded. In the vicinity of settled areas they shun, rather than attack, human beings. Alligator hides are made into highly prized leather used for belts, handbags, and shoes. Because of the demand for hides, efforts have been made to protect alligators from poachers. *See* CROCODILE. J.A.O.

ALLIGATOR LIZARD, common name for lizards of the genus *Gerrhonotus* in the Anguidae family. Four species occur in the United States. The northern alligator lizard, *G. coeruleus* has the widest range, from southern British Columbia down to central coastal California and the Sierra Nevada, and east into the Rocky Mts. in Montana All species are secretive, with short legs, long tails, and a conspicuous lateral fold on the slender body. They usually frequent moist hilly country.

ALLIGATOR PEAR. *See* AVOCADO.

ALLITERATION, in a group of words, commencement of two or more words with the same letter or sound or repetition of the same sound in two or more stressed syllables. The popular phrase "through thick and thin" is a simple example of alliteration. The technique is widely used as a literary device in the composition of prose, poetry, and oratory.

ALLOBROGES, Celtic race of ancient Gaul, whose territory lay between the Rhône and Isère rivers and Lake Geneva, in the vicinity of the present-day French-Swiss border Their chief town was Vienna (now Vienne, France) on the Rhône R., and their frontier town against the Helvetii (q.v.) was Geneva, Switzerland After they were defeated by the Romans in 121 B.C., their territory was incorporated into Transalpine Gaul In 63 B.C. envoys of the Allobroges were invited to take part in the conspiracy led by the Roman statesman Lucius Sergius Catilina (q.v.), but, preferring to perform a service for the Roman government, they informed the Roman statesman and orator Marcus Tullius Cicero (q.v.) of the plot and procured for him documentary proof of the conspiracy G.E.D

ALLOPATHY, system of medical treatment that attempts to cure a disease by applying a remedy producing an effect on the body different from the effect caused by the disease. A simple example of allopathy is the use of aspirin (q.v.) to lower a feverish body temperature. For many centuries the accepted system of medicine, allopathy did not actually receive its name until late in the 18th century, when the German physician Samuel Hahnemann (q.v.) first used the term to contrast with his own system of medicine, called homeopathy (q.v.). Allopathy is still used as a medical approach but usually in combination with other methods of treatment.

ALLORI, name of two Italian painters of the later Florentine school.

Alessandro Allori (1535–1607), born in Florence, and trained under the Florentine painter Il Bronzino (q.v.). Alessandro's style is characterized by a subtle imitation of the work of the Italian artist Michelangelo (q.v.). Alessandro worked chiefly in the churches of Florence and Tuscany and in the Villa Poggia a Cajano in Florence. He also painted portraits and wrote a treatise on anatomy for artists.

Cristofano Allori (1577–1621), born in Florence, son and pupil of Alessandro Allori. Cristofano became a better known and more important artist than his father. His style is mannered, reflecting the influence of the Italian painter Andrea del Sarto (q.v.). Cristofano's most celebrated work, "Judith with the Head of Holofernes", and his "St. Julian" are in the Pitti Palace collection in Florence. His "Isabella of Aragon Pleading with Charles VIII" is at the Louvre in Paris.

ALLOTROPES, two or more forms of the same element that differ in physical properties. Color, luster, density, hardness, odor, and electrical and thermal conductivity may differ greatly among allotropic forms. Diamond and graphite are allotropic forms of carbon (qq.v.); phosphorus (q.v.) has four allotropic forms; and the element sulfur (q.v.) has six allotropic forms which are produced by different methods of heating and cooling.

ALLOWAY, Great Britain, village of Ayr Co., Scotland, about 2 miles s of Ayre. It is the birthplace of the celebrated author and poet Robert Burns (q.v.), whose house was converted into a museum in 1880. The Burns Monument, erected in 1820, is in the village, and the "haunted kirk" and other places to which the poet referred in his writings are still to be seen in Alloway.

ALLOY, intimate mixture of two or more metals (q.v.). Alloys, like pure metals, possess metallic luster and conduct heat and electricity well, though not in general so well as the pure metals of which they are formed. On the other hand, the compounds of metals with nonmetallic elements such as sulfur or chlorine do not possess metallic properties. Mixtures of metals with elements intermediate between metals and nonmetals, particularly with carbon, are similar to alloys, and are frequently called alloys. The most important of these so called alloys is steel. Simple carbon steels consist of about .5 percent manganese and up to 8 percent carbon, with the remaining material being iron

An alloy may consist of an intermetallic compound, a solid solution, an intimate mixture of minute crystals of the constituent metallic elements, or any combination of solutions or mixtures of the foregoing Intermetallic compounds, such as $NaAu_2$, CuSn, and $CuAl_2$, do not follow the ordinary rules of valency. They are generally hard and brittle and, although they have not been important in the past where strength is required, many new developments have appeared which make such compounds of increasing importance. Alloys consisting of solutions or mixtures of two metals generally have lower melting points than the pure constituents. The mixture with a lower melting point than any other mixture of the same constituents is called a eutectic mixture. The eutectoid, which is the solid-phase analogue of the eutectic, frequently has better strength and other physical characteristics than alloys of different proportions, and is frequently used Eutectic alloys of three or four metals, with lower melting points than alloys of slightly different proportions, are also frequently used

The properties of alloys are frequently far different from those of the constituent elements, and such properties as strength and corrosion resistance may be considerably greater for an alloy than for any of the separate metals. For this reason, alloys are more generally used than pure metals Thus, steel is stronger and harder than wrought iron, which is approximately pure iron, and is used in far greater quantities. The alloy steels, mixtures of steel with such metals as chromium, manganese, molybdenum, nickel, tungsten, and vanadium, are stronger and harder than steel itself, and many of them are also more corrosion-resistant than iron or steel. An alloy can often be made to match a predetermined set of characteristics The most obvious case in which particular characteristics are necessary is in the design of rockets, spacecraft, and supersonic aircraft The materials used in these vehicles and their engines must be light in weight, very strong, and able to sustain very high temperatures without losing their strength. Aerodynamic friction causes these vehicles to heat up excessively. To withstand these high temperatures and reduce the overall weight, lightweight, high-strength alloys of aluminum, beryllium, and titanium have been developed To resist the heat generated during reentry into the atmosphere of the earth, alloys containing heat-resistant metals such as tantalum, columbium, tungsten, cobalt, and nickel are being used in space vehicles

A wide variety of special alloys containing metals such as beryllium, boron, columbium, hafnium, and zirconium, which have particular nuclear absorption characteristics, are being used in nuclear reactors (*see* NUCLEAR POWER) Niobium-tin alloys are used as electrical conductors at extremely low (cryogenic) temperatures Special copper, nickel, and titanium alloys, designed to resist the corrosive effects of boiling salt water for twenty to thirty years, are being used in desalinization plants

Most alloys are prepared by mixing the molten metals. A recently developed process, called powder metallurgy, is becoming increasingly important in the preparation of alloys that have special characteristics. In this process the alloys are prepared by mixing dry powders of the metals, squeezing them together under high pressure, and then heating them to temperatures just below their melting points. The result is a solid, homogeneous alloy. Tough tungsten alloys containing nickel, iron, or copper are prepared in this way for use as cutting tools. Mass-produced products may be prepared by this technique at great savings in cost. For example, gears used in washing machines are made to exact measurement, without machining, by mixing a small quantity of copper powder into a quantity of iron powder and then subjecting the mixture to high pressure. The resulting gear is ready for immediate use. Other new alloys made possible by powder metallurgy are cermets, which are alloys of metal and carbides, borides, oxides, silicides, or nitrides. Cermets combine the advantages of the high-temperature strength, stability, and oxidation resistance of the ceramic compound with the ductility and shock resistance of the metal.

Sterling silver, 14-karat gold, white gold, and platinum-iridium are precious-metal alloys. Babbitt metal, brass, Britannia metal, bronze, Dowmetal, German silver, gun metal, monel metal, pewter, and solder are familiar alloys of less precious metals. Commercially pure aluminum is, because of its impurities, actually an alloy (*see* ALUMINUM). The alloys of mercury with other metals are called amalgams.

ALL SAINTS' DAY, *or* ALLHALLOWS, *or* HALLOWMAS, festival celebrated on Nov. 1 in the Roman Catholic and Anglican churches in honor of God and all His saints, known and unknown It became established as a church festival early in the 7th century when the Pantheon (q v) in Rome was consecrated as the Church of the Blessed Virgin and All Martyrs. Pope Gregory IV (d 844) gave the custom official authorization in 835 Nov 1 may have been chosen because it was the day of one of the four great festivals of the heathen nations of the north, and it was church policy to supplant heathen by Christian observances *See* HALLOWEEN

ALL SOULS' DAY, in the Roman Catholic Church, a festival falling on Nov. 2, the object of which is, by prayers and almsgiving, to assist souls in purgatory First instituted in the monastery of Cluny, France, in 998, the observance soon became general, without any ordinance at large on the subject Among European peasants, All Souls' Day is a time for reviving many pre-Christian folk customs Roman Catholic priests are permitted to say three requiem Masses on this day

ALLSPICE. *See* PIMENTO

ALLSTON, Washington (1779–1843), American painter and author, born on a plantation on the Waccamaw River, S.C., and educated at Harvard University, at the Royal Academy in London, in Paris, and in Florence and Rome In 1818 he settled permanently in the United States, living for the remainder of his life in and near Boston, Mass. His paintings are numerous and technically proficient, portraying dramatic subjects, usually scriptural or classical. A large painting entitled "Belshazzar's Feast" (Boston Athenaeum) occupied the last twenty-five years of his life, but was left unfinished. His writings include a collection of poems, *The Sylphs of the Seasons* (1813); a romance, *Monaldi* (1842), and *Lectures on Art* (posthumously published, 1850)

ALLUVIUM, clay, gravel, sand, silt, or similar loose material deposited by flowing water Alluvium usually occurs at any point where the velocity of fast-running water is abruptly slowed and the carrying capacity of the flow reduced to a point where transport of the sediment is no longer possible. Alluvial deposits are found on the floodplains of river valleys, through river deltas, and where steep mountain streams enter quiet lakes or flow out onto a comparatively flat surface. When the deposit, in the course of its accumulation, takes the shape of a fan or cone, as at the base of a mountain, it is called an alluvial fan. Among the great alluvial deposits of the world are the deltas of the Nile R. in Egypt, the Ganges R. in India, and the Hwang Ho R in China, and the floodplain of the Mississippi R. in North America (qq.v.) *See* DELTA; DEPOSIT; GEOLOGY; RIVER. Compare EROSION.

ALMA-ATA, city in the Soviet Union, and capital of the Kazakh S.S.R., in the N. foothills of the Tien Shan Mts., about 150 miles W. of the border with China, and about 2000 miles S.E. of Moscow. Located in the center of a fertile agricultural and orchard region, Alma-Ata is a major food-processing center. It is also the center of a motion-picture industry, and a major manufacturing center for heavy machinery, cotton and other textiles, champagne, and tobacco. The city is the site of several cultural and educational establishments including the Kazakh and Russian opera houses, a large public library, a state university, and an academy of sciences. Founded as a Russian fort in 1855, the city was twice destroyed (1887, 1910) by earthquakes. It began to develop rapidly as an economic and manufacturing center in the 1920's, when it became the capital of the republic and the Turkestan-Siberian railway was built. Pop. (1970 est.) 730,000.

ALMAGEST. *See* Ptolemy (astronomer).

ALMAGRO, Diego de (1475?–1538), Spanish soldier and adventurer, born in Almagro, near Ciudad Real. He came to America in 1514, and settled in the new town of Panama five years later. In 1524 he formed a partnership with the Spanish explorer Francisco Pizarro (q.v.) to explore and conquer the region on the coast of the Pacific Ocean south of Panama, which was reported to hold deposits of gold. In their first two expeditions (1524–25 and 1526), though beset by great hardships, they learned of the wealth of the Incan empire (*see* Inca; Peru: *History*). In 1529 Pizarro was granted authority by Charles V (q.v.), Holy Roman Emperor, to conquer and rule Peru, and in 1533 the partners completed the conquest of the country. In 1535 Charles V appointed Almagro governor of New Toledo, an area lying south of Pizarro's grant and including the northern portion of present-day Chile. After invading and subjugating his lands in 1535–36, Almagro claimed that Cuzco (q.v.), the ancient Incan capital, lay within his region and entered the city as the legitimate governor. Consequently, a civil war broke out between the followers of Almagro and those of Pizarro. Pizarro's unsuccessful attempts to negotiate a peaceful settlement were broken off in November, 1537, and in 1538 Almagro was captured and executed by Pizarro's forces.

ALMANAC (Ar. *al manākh,* "the weather"), book or table containing a calendar of days, weeks, months, and years, together with astronomical and navigational data and statistics and, often, church feasts and fasts, historical notes, condensed information on various other subjects, proverbs, and astrological and other forecasts. The word almanac was adopted from the Arabic by the English philosopher Roger Bacon (q.v.), who used it in his encyclopedic work *Opus Majus* (1267), to designate a section devoted to movements of the celestial bodies. Early almanacs contained so much astrological and other predictions that they were commonly given the alternative title "prognostications". About the beginning of the 19th century the fashion for prediction declined, and two new types of almanac appeared: the scientific almanac, or ephemeris, devoted entirely to astronomical and navigational tables, and the informational almanac, or yearbook, containing the statistics, data, and other condensed matter.

Compilations similar to almanacs are known to have been made by the ancient Egyptians and Greeks of the Alexandrian Age (q.v.). The Romans had calendars known as *fasti sacri,* which somewhat resembled modern almanacs. In the Middle Ages manuscript almanacs were circulated in Europe, and clog almanacs (primitive calendars carved on wood blocks) were used in England. The earliest printed almanac was *Pro Pluribus Annis*, published in Vienna in 1457 by the Austrian mathematician Georg Purbach, or Peuerbach (1423–61). Purbach's pupil, the German mathematician and astronomer Johann Muller (1436–76), known as Regiomontanus, compiled *Ephemerides ab Anno* (1473). Müller's almanac, which covered thirty years from 1475, was used by the discoverer of America Christopher Columbus (q.v.) and by other navigators. Unlike other early almanacs, these contained no astrological prophecies. In 1533 the French writer François Rabelais (q.v.) published, at Lyon, his almanac for that year, and subsequently published almanacs for 1535, 1548, and 1550. The publication of predictions grew to such an extent that in the 16th century, Henry III (q.v.), King of France, prohibited the insertion of political prophecies in almanacs; this prohibition was renewed by Louis XIII (q.v.) in 1628. One of the most popular French almanacs was the *Almanach Liégois*, first published in 1636. In 1679 the *Almanach Royal* was founded; as the *Almanach National* this publication has become the most important almanac in France.

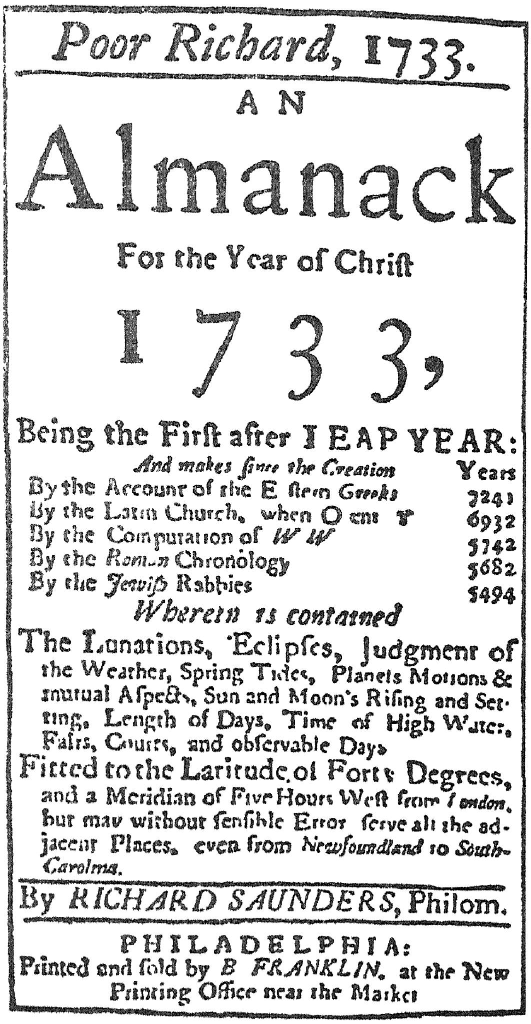
In England James I (q.v.), King of Great Britain, gave a monopoly of trade in prognostications to the universities of Oxford and Cambridge and the Stationers' Company (the London guild of publishers). Under their patronage, and with the imprimatur of the archbishop of Canterbury, flourished such productions as the *Merlini Ephemeris* (1644–81) of the English astrologer William Lilly (1602–81), *Poor*

Robin's Almanac (1664–1824), and Moore's Almanac. In 1775 a decision of the Court of Common Pleas abolished the monopoly, but the Stationers' Company remained the principal publisher of almanacs in England. The principal almanac is the *British Almanac,* first published in 1828 by the Society for the Diffusion of Useful Knowledge. This publication was the first of the modern informational almanacs, containing factual data only. Other informational almanacs include *The Statesman's Year-Book* (1863) and *Whitaker's Almanack* (1868), both of which are devoted chiefly to political information.

In Scotland, *Prognostications,* published in Aberdeen, sold widely; about 1677 the annual circulation amounted to 50,000 copies. In 1683 appeared *Edinburgh's True Almanac, or a New Prognostication,* which was soon followed by the *Edinburgh Almanac.* The latter has been published as a modern informational almanac since 1837 under the title of *Oliver & Boyd's New Edinburgh Almanac.*

The earliest American almanac was that of the mariner William Pierce, published in Cambridge, Mass., in 1639. Better known was the almanac of the colonial printer William Bradford (1663–1752), published in 1687 in Philadelphia, Pa., but most famous of early American almanacs was *Poor Richard's Almanac,* published by the American statesman Benjamin Franklin (q.v.) from 1732 to 1757 under the pen name Richard Saunders. The longest-lived American almanac is *The Old Farmer's Almanac,* which was first published in 1792 by the publisher Robert Bailey Thomas (1766–1846) and has retained its original format despite changes in ownership. In the mid-20th century it still provides American farmers with information about agriculture, as well as with long-range weather forecasts, old jokes, homespun verses, and moral tales. In Boston the *American Almanac and Repository of Useful Knowledge* was started in 1828; it ceased publication in 1861. The *American Almanac and Treasury of Facts* was published from 1878 to 1889 by the librarian Ainsworth Rand Spofford (1825–1908).

In the late 19th century numerous almanacs were published by newspapers. Of these almanacs the *World Almanac,* published from 1868 to 1876 by the New York *World,* and revived in 1886 by the American journalist Joseph Pulitzer (q.v.), and the *Texas Almanac,* founded in 1857 by the Dallas *Morning News,* are still published today. The *Chicago Daily News Almanac* was founded in 1874 by the Chicago *Daily News;* it enjoyed widespread popularity for several decades but ceased publication in 1937.



Poor Richard, 1733.

AN

Almanack

For the Year of Chriſt

1733,

Being the Firſt after LEAP YEAR:

And makes ſince the Creation Years
By the Account of the *Eaſtern Greeks* 7241
By the Latin Church, when ☉ ent. ♈ 6932
By the Computation of *W. W.* 5742
By the *Roman* Chronology 5682
By the *Jewiſh* Rabbies 5494

Wherein is contained

The Lunations, Eclipſes, Judgment of the Weather, Spring Tides, Planets Motions & mutual Aſpects, Sun and Moon's Riſing and Setting, Length of Days, Time of High Water, Fairs, Courts, and obſervable Days.

Fitted to the Latitude of Forty Degrees, and a Meridian of Five Hours Weſt from *London,* but may without ſenſible Error ſerve all the adjacent Places, even from *Newfoundland* to *South-Carolina.*

By *RICHARD SAUNDERS,* Philom.

PHILADELPHIA:
Printed and ſold by *B. FRANKLIN,* at the New Printing Office near the Market

The title page of the first edition of Poor Richard's Almanac, *published (1732) by Benjamin Franklin under the pseudonym Richard Saunders.*

Scientific almanacs are published, usually under government sponsorship, for the benefit of astronomers and navigators. Several famous almanacs of this type, begun in the 17th and 18th centuries, are still in use today. The oldest of these is the French *Connaissance des Temps,* started in 1679, and now published under the authority of the Bureau des Longitudes. In Great Britain, the *Nautical Almanac* was founded by the astronomer Nevil Maskelyne (1732–1811) and first published, with the authority of the British government, in 1767. The German *Berliner Astronomisches Jahrbuch* was started in 1776 by the astronomer Johann Elert Bode (q.v.). Among leading present-day scientific almanacs is the *American Ephemeris and Nautical Almanac,* founded by the American naval officer Charles Henry Davis (1807–77). It was first issued for the year 1855 by the Naval Observatory (q.v.) In the mid-20th century many general almanacs, almanacs of regional interest, and almanacs with specialties other than science have been published. Notable among the general almanacs are *Information Please Almanac*, which originated in 1947, and *Reader's Digest Almanac and Yearbook*, first published in 1965. In 1969 the first issue of the *New York Times Encyclopedic Almanac* appeared; under different editorial auspices, in 1973, it was retitled *The Official Associated Press Almanac*. Among the almanacs of regional interest are the *Bulletin Almanac*, published by the Philadelphia *Bulletin*, the *Buffalo News Almanac*, published by the Buffalo *News*, and the *Illinois Fact Book and Historical Almanac, 1673–1968*, compiled by John Clayton and issued by the Illinois Sesquicentennial Commission in 1970. Notable among the specialized almanacs is the *National Catholic Almanac*, devoted to activities of the Roman Catholic Church. H.Ha

ALMANDITE. *See* GARNET

ALMA-TADEMA, Sir Lawrence (1836–1912), British painter, born in Dronrijp, the Netherlands, and trained at the Academy of Antwerp, Belgium. He lived and worked in Brussels, Belgium, from 1863 to 1869, when he settled permanently in England. He became a naturalized British subject in 1873. Alma-Tadema's paintings are noted for their fine details, smooth finishes, and realistic representations of marble and other textures. Most of his canvases depict idealized settings of the ancient civilizations of Egypt, Greece, and Rome, and of medieval France. He painted about five hundred pictures, including "A Roman Emperor" (1871), "The Mummy" (1872), "The Way to the Temple" (1883), and "Gold Fish" (1900) Alma-Tadema became a member of the Royal Academy in 1879 and was knighted in 1899.

ALMEIDA, Dom Francisco de (1450–1510), Portuguese soldier. He first distinguished himself at the conquest of Granada in 1492 In 1505 Emanuel (q.v.), King of Portugal, appointed him the first Portuguese viceroy of Portuguese India, where he strove to exclude the Muslims and Venetians from all commerce with the East. In 1507 he ravaged the Muslim port of Goa as well as other seaports on the coast of India and completely destroyed the Muslim fleet at Diu. He was slain in an obscure battle with the Hottentots (q.v.) at Cape Saldanha, South Africa.

ALMEIDA-GARRETT, João Baptista da Silva Leitão, Visconde de (1799–1854), Portuguese poet, founder of the romantic movement in Portuguese literature (q.v.), born in Oporto, and educated at the University of Coimbra. He participated in the constitutionalist revolt of 1820; in 1823 when the reactionary Miguelistas, followers of the pretender to the throne of Portugal, Dom Miguel (1802–66), took power he fled from Portugal (see PORTUGAL *History*) Almeida-Garrett's writings before his exile had reflected the spirit of French classicism, in England and France, however, he was influenced by the Scottish novelist and poet Sir Walter Scott (q.v.), and the French romanticists This influence is reflected in his epic *Camões* (1825), the theme of which is the poet's longing for home; and in *Dona Branca* (1826) a long satire on monastic life. In 1832 Almeida Garrett returned to Portugal and helped Dom Pedro (see PEDRO I) in his attempt to regain the Portuguese throne, which had been usurped by Pedro's brother After Dom Pedro's victory of 1833, Almeida-Garrett was made minister of the interior Subsequently, as a member of the national Cortes (q.v.), or legislature, he demonstrated uncompromising support of democratic principles He interested himself especially in the founding of a national theater and a conservatory of dramatic art. He wrote a long series of prose dramas in which the central figures are typical national characters. One of his most important contributions to literature is his *Romanceiro* (1851–53), a collection of early Portuguese ballads and romances. His last work, published in 1853, was a collection of love poems

ALMERÍA (anc. *Urci* and *Porto Magnus*), seaport in Spain, and capital of Almeria Province, about 60 miles S.E. of Granada It exports iron, lead, white Almeria grapes, esparto grass, and oranges Almeria was an important trading center in Roman times, and it was used as an arsenal by the Moors In May, 1937, during the Spanish Civil War, the city was severely bombarded by five German warships in retaliation for an attack by Loyalist airplanes upon the German warship *Deutschland* and the Italian warship *Barletta* Pop (1970) 114,510

ALMOHADS *or* **ALMOHADES** (Ar. *al-muwahhid*, "who proclaim the unity of God"), Spanish name of the Berber Muslim reform movement and dynasty established in North Africa and Spain during the 12th and 13th centuries. Because of their belief in the unity of God, the Almohads were known as Unitarians. The origin of the movement is traced to ibn-Tumart (about 1078–1130), an Arab reformer in Morocco who preached moral reform and the doctrine of the unity of divine being. He gathered a large following of Arabs and Berbers and in 1121 was proclaimed Al Mahdi ("the rightly guided"). The founder of the dynasty was the Berber Abd-al-Mumin (about 1094–1163), who succeeded ibn-Tumart and took the title of caliph He conquered Morocco and other parts of North Africa (1140–47), thus putting an end to the previous dynasty of the Almoravids (q v.) By 1154 he ruled also Islamic Spain and part of Portugal Notable among successive Almohad rulers was al-Mansur, who ruled in Spain from 1184 to 1199, when he died He aided the sultan Saladin (q v.) against the Crusaders and was responsible for the construction of numerous architectural monuments. The Almohad dynasty flourished until 1212, when the united kings of Castile, Aragón, and Navarre defeated the Almohad forces in the Battle of Navas de Tolosa. Thereafter the power of the Almohads declined and finally came to an end in Spain in 1232 and in Africa in 1269. *See* SPAIN: *History;* BERBER

ALMOND, common name for a small tree, *Prunus amygdalus* in the family Rosaceae, and for the fruit of the tree. The tree is characterized by the coarsely furrowed and wrinkled shell (called endocarp or putamen) of the drupe, and by the young leaves being conduplicate, or having their sides folded along the central vein. The almond tree resembles the peach tree; it grows to a height of about 20 to 30 ft. It is a native of western Asia, but now grows wild throughout the south of Europe, and is cultivated in the United States. The wood of the almond tree is hard, of reddish color, and is used by cabinetmakers. The almond is valued chiefly for the kernel of its fruit, the almond nut, which is an important article of commerce. Varieties of the almond are classified as either sweet or bitter. Sweet almonds contain a large quantity of a bland, fixed oil, emulsin, gum, and mucilage sugar; have an agreeable taste; and are nutritious. Bitter almonds contain the same substances and, in addition, a crystalline glucoside called amygdalin. In commerce, the long almonds of Malaga, known as Jordon almonds, and the broad almonds of Valencia, are the most valued.

The so-called dwarf almond (*A. nana*) is similar to the common almond, except that it is a low shrub, seldom more than 2 or 3 ft. tall. Its fruit is also similar, but smaller. It is common in the plains of the south of the U.S.S.R. and is frequently planted as an ornamental shrub in England. Flowering almonds, shrubs or small trees, are cultivated extensively in the U.S. for their profusion of showy, white to rose blossoms.

ALMORAVIDS *or* **ALMORAVIDES,** Berber dynasty that ruled in Africa and Spain in the 11th and 12th centuries. Between 1053 and 1061 a large part of northwestern Africa was subjugated by the Muslim movement for religious reform known as "the hermits" (Ar. *al-murābit*) Leadership of the movement passed in 1061 to Yusuf ibn-Tāshfīn (d. 1106), a Berber chieftain who had previously conquered the region comprising present-day Morocco In 1062 he assumed the title of king After enlarging their domain in northwestern Africa, the Almoravids invaded Spain in 1086 and during the next four years conquered the area between the Tagus and Ebro rivers In 1147 the dynasty was overthrown by the Almohads (q.v), another Muslim reform movement

ALMQVIST, Karl Jonas Ludvig (1793–1866), Swedish writer, born in Stockholm, and educated at the University of Uppsala He gave up a post in the civil service to found a cooperative community in 1823, but after two years returned to Stockholm to become the rector of an experimental secondary school. In the mid-1830's he began to publish prose and verse works. His novels, short stories, poems, and verse dramas were collected in a series called *Tôrnrosens Bok* ("The Book of the Thorn Rose", 14 vol., 1832–51). Almqvist's work marks the transition from Romanticism to realism (qq v) in Swedish literature His most important single work is *Det Går An* ("It Will Do", 1839, Eng trans., *Sara Videbeck,* 1919), a realistic story dealing with love and marriage. In 1851 Almqvist was charged with forgery and murder. He fled first to the United States and later to Bremen, Germany, where he lived for the rest of his life under the name of Professor Westermann

ALNUS. *See* ALDER

ALOE, genus of plants in the Lily family (Liliaceae). More than 150 species are known, mostly native to South Africa; they usually have short stems, fleshy, lanceolate leaves crowded in rosettes at the end of the stem, and red or yellow tubular flowers in dense clusters. Species of *Aloe* vary in height from a few inches to 30 ft.; they are widely cultivated garden plants in tropical and subtropical regions and tub plants in cooler climates. Several species are of commercial importance as the source of the aloes used in medicine. The name aloe denotes also plants in the genus *Agave* (q.v), the American aloe, or century plants, *A. americana;* and the false aloe, *A. virginica.*

ALOSA. *See* SHAD.

ALOYSIUS. *See* GONZAGA, SAINT ALOYSIUS

ALPACA, common name for South American mammal, *Lama pacos,* in the Camel family (Camelidae). Partially domesticated, the alpaca possibly was derived from the wild guanaco (q.

v.) and is closely related to the llama and vicuña (qq.v.). The natural habitat of the alpaca is the Andes Mts. in South America. It is most commonly kept in flocks by the Indians in the highlands of Peru and Chile.

The alpaca is smaller than the llama, has longer, softer wool, and ordinarily is not used as a beast of burden. Like the llama, it spits when angry. A sure-footed animal, the alpaca resembles a large sheep, except for its elongated, erect neck. After eleven months gestation the female gives birth to one offspring. The young have short wool until they mature.

The long, soft fleece of the alpaca, Lama pacos, *is used in the production of fine woolen cloth*

New York Zoological Society

Flocks of alpacas graze almost wild on high plateaus, 14,000 to 16,000 ft. above sea level. At shearing time the Indians drive them to the villages and clip off about 8 in. of the wool. The alpaca provides white, gray, or yellow wool, although the black and dark-brown fibers are especially valued. The fiber is elastic and strong and is straighter and more silky than the wool of sheep. Although the flesh of the alpaca is very palatable, the animal is kept primarily for its wool, from which a fine cloth is made.

ALPENA, city of Michigan, and county seat of Alpena Co., on Thunder Bay, an arm of Lake Huron, about 107 miles N of Bay City. The city manufactures machinery, paper, textiles, beverages, insulating materials, and cement, and the harbor handles about 10,000,000 tons of nonmetallic minerals, coal, and lignite. Alpena is a summer and winter sports resort and the site of Alpena Community College. Originally known as Fremont, the city was renamed in 1859 and incorporated in 1871. Pop. (1960) 14,682; (1970) 13,805.

ALPENHORN, *or* ALPINE HORN or KUH HORN, simple, wooden musical instrument with a cupped mouthpiece and a conical bore ending in a bell, or flare. The length and shape vary from 3 ft. and somewhat curved to about 10 ft. and straight except for a slight curve of the bell. The notes are open harmonics of the tube (*see* HARMONY), and the quality of the tone is modified by the material and the size of the bore in relation to its length. Alpenhorns were originally used by mountaineers in Switzerland and other countries to convey signals in time of war; they are now used chiefly by cowherds.

ALPHABET (from *alpha* and *beta*, the first two letters of the Greek alphabet), set of written symbols, each representing a given sound or sounds, which can be variously combined to represent all the words of a language.

An alphabet attempts ideally to indicate each separate sound by a separate symbol, though this end is seldom attained. Alphabets are distinguished from syllabaries and from pictographic and ideographic systems. A syllabary represents each separate syllable (usually a sequence of from one to four spoken sounds pronounced as an uninterrupted unit) by a single symbol. Japanese, for example, has two complete syllabaries, the *hiragana* and the *katakana*. A pictographic system represents picturable objects, for example, a drawing of the sun stands for the spoken word "sun". An ideographic system combines various pictographs for the purpose of indicating nonpicturable ideas. Thus, the Chinese pictographs for "sun" and "tree" are combined to represent the Chinese spoken word for "east".

Early systems of writing were of the pictographic-ideographic variety, among them are the cuneiform (q.v.) of the ancient Babylonians and Assyrians, the old Egyptian hieroglyphics (q.v.), the written languages still used by the present-day Chinese and Japanese (*see* CHINESE LANGUAGE, JAPANESE LANGUAGE), and the Mexican, or Mayan, picture writing (*see* MAYAS). What converts such a system into an alphabet or syllabary is the use of a pictograph or ideograph to represent a sound rather than an object or an idea. The sound is usually the initial sound of the spoken word denoted by the original pictograph. Thus, in early Semitic, a pictograph representing a house, for which the Semitic spoken word was *beth*, eventually came to symbolize the initial *b* sound of *beth*. This Semitic symbol,

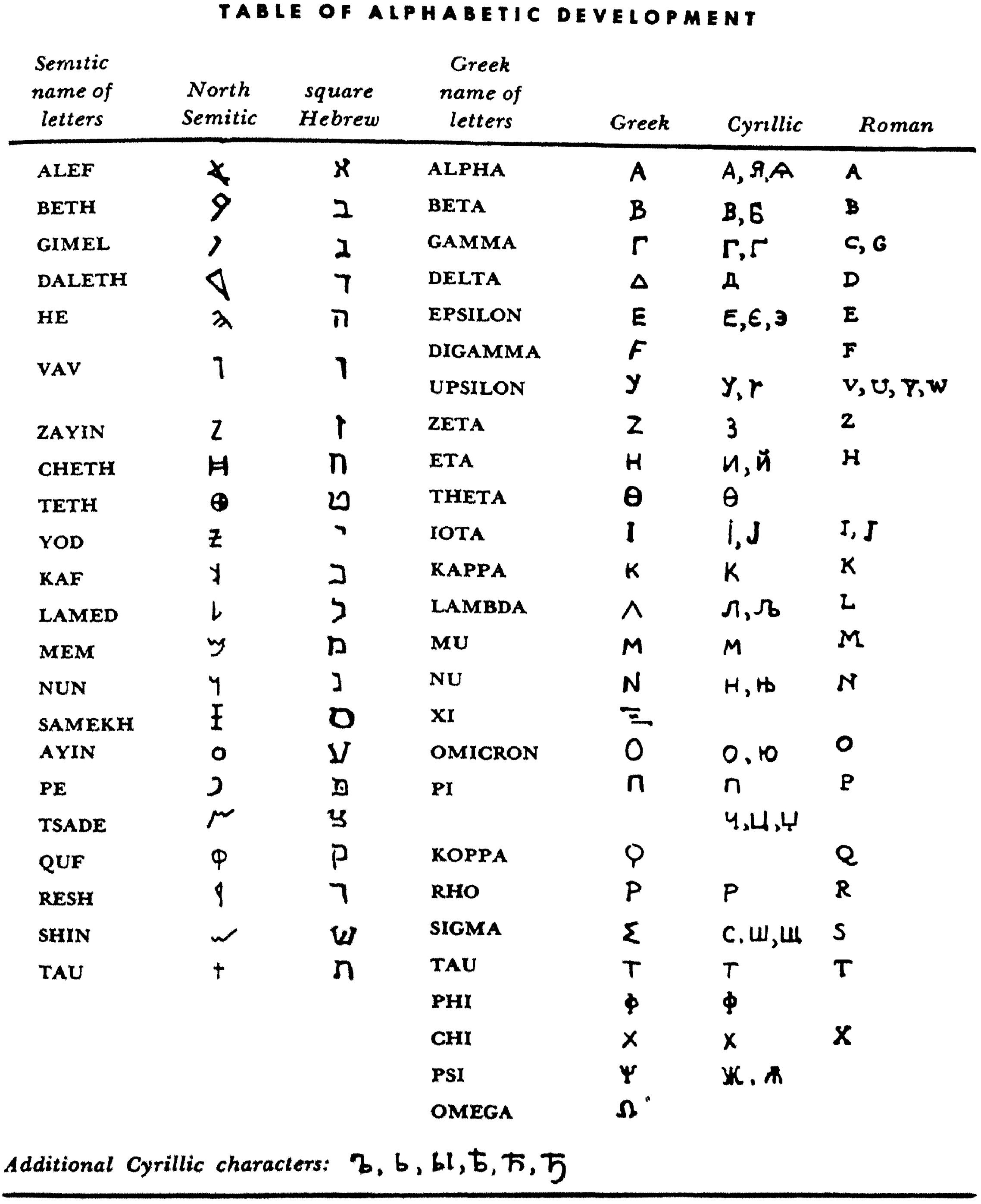


TABLE OF ALPHABETIC DEVELOPMENT

Semitic name of letters	*North Semitic*	*square Hebrew*	*Greek name of letters*	*Greek*	*Cyrillic*	*Roman*
ALEF	𐤀	א	ALPHA	Α	А, Я, Ѧ	A
BETH	𐤁	ב	BETA	Β	В, Б	B
GIMEL	𐤂	ג	GAMMA	Γ	Г, Ґ	C, G
DALETH	𐤃	ד	DELTA	Δ	Д	D
HE	𐤄	ה	EPSILON	Ε	Е, Є, Э	E
VAV	𐤅	ו	DIGAMMA	Ϝ		F
			UPSILON	Υ	У, Ѵ	V, U, Y, W
ZAYIN	𐤆	ז	ZETA	Ζ	З	Z
CHETH	𐤇	ח	ETA	Η	И, Й	H
TETH	𐤈	ט	THETA	Θ	Ѳ	
YOD	𐤉	י	IOTA	Ι	І, Ј	I, J
KAF	𐤊	כ	KAPPA	Κ	К	K
LAMED	𐤋	ל	LAMBDA	Λ	Л, Љ	L
MEM	𐤌	מ	MU	Μ	М	M
NUN	𐤍	נ	NU	Ν	Н, Њ	N
SAMEKH	𐤎	ס	XI	Ξ		
AYIN	𐤏	ע	OMICRON	Ο	О, Ю	O
PE	𐤐	פ	PI	Π	П	P
TSADE	𐤑	צ			Ч, Ц, Џ	
QUF	𐤒	ק	KOPPA	Ϙ		Q
RESH	𐤓	ר	RHO	Ρ	Р	R
SHIN	𐤔	ש	SIGMA	Σ	С, Ш, Щ	S
TAU	𐤕	ת	TAU	Τ	Т	T
			PHI	Φ	Ф	
			CHI	Χ	Х	X
			PSI	Ψ	Ж, Ѫ	
			OMEGA	Ω		

Additional Cyrillic characters: Ъ, Ь, Ы, Ѣ, Ћ, Ђ

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Evolution of the alphabet

standing originally for the entire word *beth* and later for the sound of *b,* ultimately became the *b* of the English alphabet.

It is generally supposed that the original Semitic alphabet, the first known alphabet, developed from a combination of cuneiform and hieroglyphic symbols; some symbols might have been taken from kindred systems, such as the Cretan and Hittite. The Semitic alphabet consisted exclusively of consonants The vowel sounds of a word had to be supplied by the speaker or reader. The present-day Hebrew and

Arabic alphabets still consist of consonantal letters only, however, vowels may be indicated in writing by optional vowel points and dashes placed below, above, or to the side of the consonant (*see* SEMITIC LANGUAGES).

About 1000 B.C. the Semitic alphabet was adopted by the Greeks. Its twenty-two consonantal symbols were expanded to twenty four (an even greater number appears in some Greek dialects), and some of the original consonantal symbols were set apart to serve exclusively as vowels (*see* GREEK LANGUAGE). The Greek alphabet spread throughout the Mediterranean world, giving rise to various modified forms. Among these were the Etruscan, Oscan, Umbrian, and Roman alphabets. Because of the spread of the Latin language, the Roman alphabet eventually became the alphabet of all the languages of western Europe.

About 900 A.D. Greek missionaries from Constantinople (now İstanbul, Turkey) converted the Slavs to Christianity and devised for them a system of writing known as Cyrillic (*see* CYRILLIC ALPHABET) from the name of one of its inventors, the Apostle to the Slavs, Saint Cyril (q.v.). The Cyrillic, like the Roman alphabet, stems from the Greek; however, additional characters were devised to represent Slavic sounds that had no Greek equivalents. The Cyrillic alphabet, in various forms, is used presently in Russian, Ukrainian, Serbian, and Bulgarian, but not in Polish, Czech, Slovak, Croatian, or Slovenian, which use modified Roman alphabets.

The Arabic alphabet, another offshoot of the early Semitic one, has spread to such languages as Persian and Urdu, and is generally used by peoples following the Islamic faith. The question arises whether the various alphabets of India and southeastern Asia are indigenous developments or offshoots of early Semitic. One of the most important Indian alphabets, the Devanagari alphabet used in Sanskrit (*see* SANSKRIT LANGUAGE) is an ingenious combination of syllabic and true alphabetic principles. The progenitors, whether Semitic or Indian, of the Devanagari alphabet seem also to have given rise to the written languages of Bengali, Tamil, Telugu, Singhalese, Burmese, and Siamese, or Thai.

Any alphabet used by peoples speaking different languages undergoes modifications. Such is the case with respect both to the number and form of letters used and to the subscripts and superscripts (accents, cedillas, tildes, dots, and others) used with the basic symbols to indicate modifications of sound. The letter *c* with a cedilla, for instance, appears regularly in French, Portuguese, and Turkish, but rarely, except in borrowed words, in English (for example, "façade"). The value of the cedilla in French, Portuguese, and English is that of s, but in Turkish it represents the *ch* sound in church. It used to represent *ts* in Spanish, but that sound no longer exists in standard Spanish. So, too, letters have different sound values in different languages. The letter j, for example, designates a soft *g* sound (as in gem) in English, but a *y* sound in German.

Although alphabets develop as attempts to establish a correspondence between sound and symbol, most alphabetically written languages are highly unphonetic, largely because the system of writing remains static while the spoken language evolves. Thus, the spelling of the English word "knight" reflects the pronunciation of an earlier period of the language, when the initial k was pronounced and the gh represented a sound, since lost, similar to the German *ch* in *Wacht*. The divergence between the written and spoken forms of certain languages, particularly English, has prompted movements for spelling *reform* (q.v.). *See also* LANGUAGE; WRITING, and articles on the individual letters. M.P.

ALPHA PARTICLES. *See* RADIOACTIVITY.

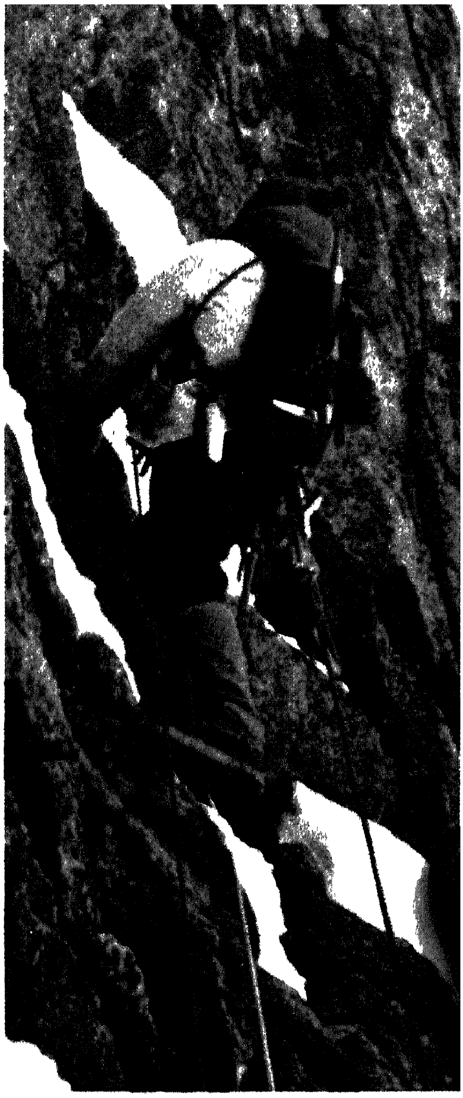
ALPHONSO. *See* ALFONSO.

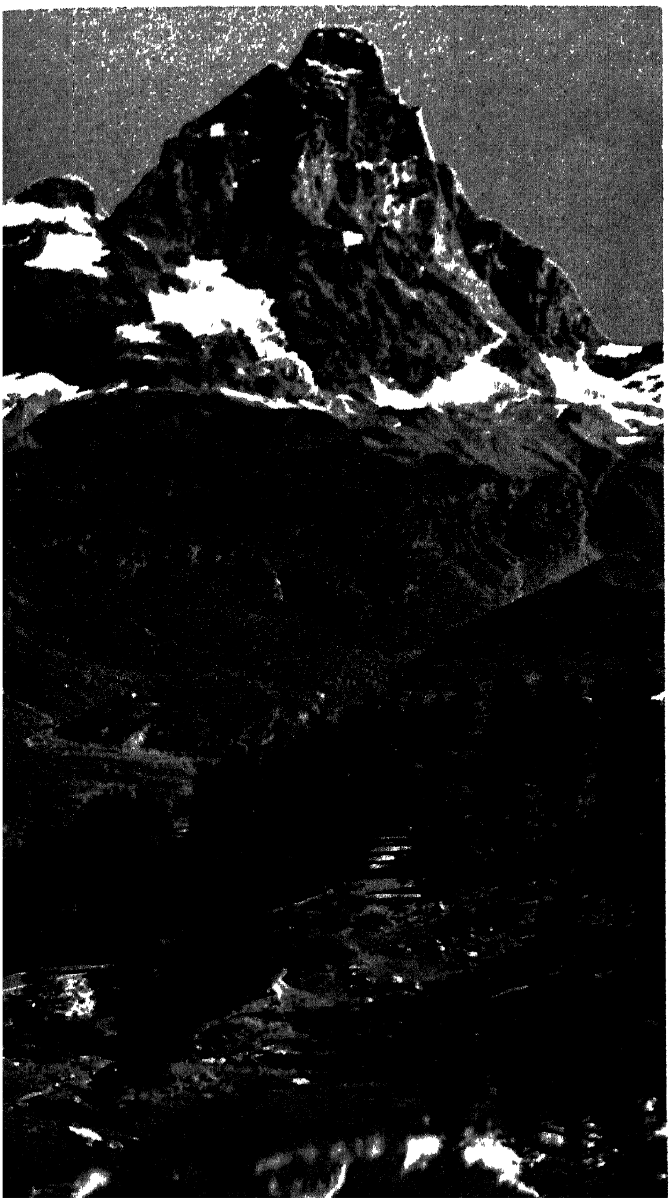
ALPHONSUS, Saint. *See* LIGUORI, SAINT ALFONSO MARIA DE.

ALPS, part of the Alpine mountain system of western and central Europe, extending into southeastern France, most of Switzerland and Austria, Liechtenstein, northern Italy, northwestern Yugoslavia, and southern Germany. Switzerland, Liechtenstein, and Austria are considered the so-called true Alpine countries. In these countries, the tourist industry is very important; visitors come from all over the world for the spectacular scenery, and for skiing and mountain climbing (qq.v.). Other important economic activities include dairy farming and forestry. The lower slopes of the mountains are covered with deciduous forests, especially beech and oak, and higher up, coniferous forests. Above the timberline are the Alpine meadows, used in summer for grazing, and finally the snow line. The climate of the Alpine region varies, but in general, summers are warm and winters cool, becoming colder at higher altitudes.

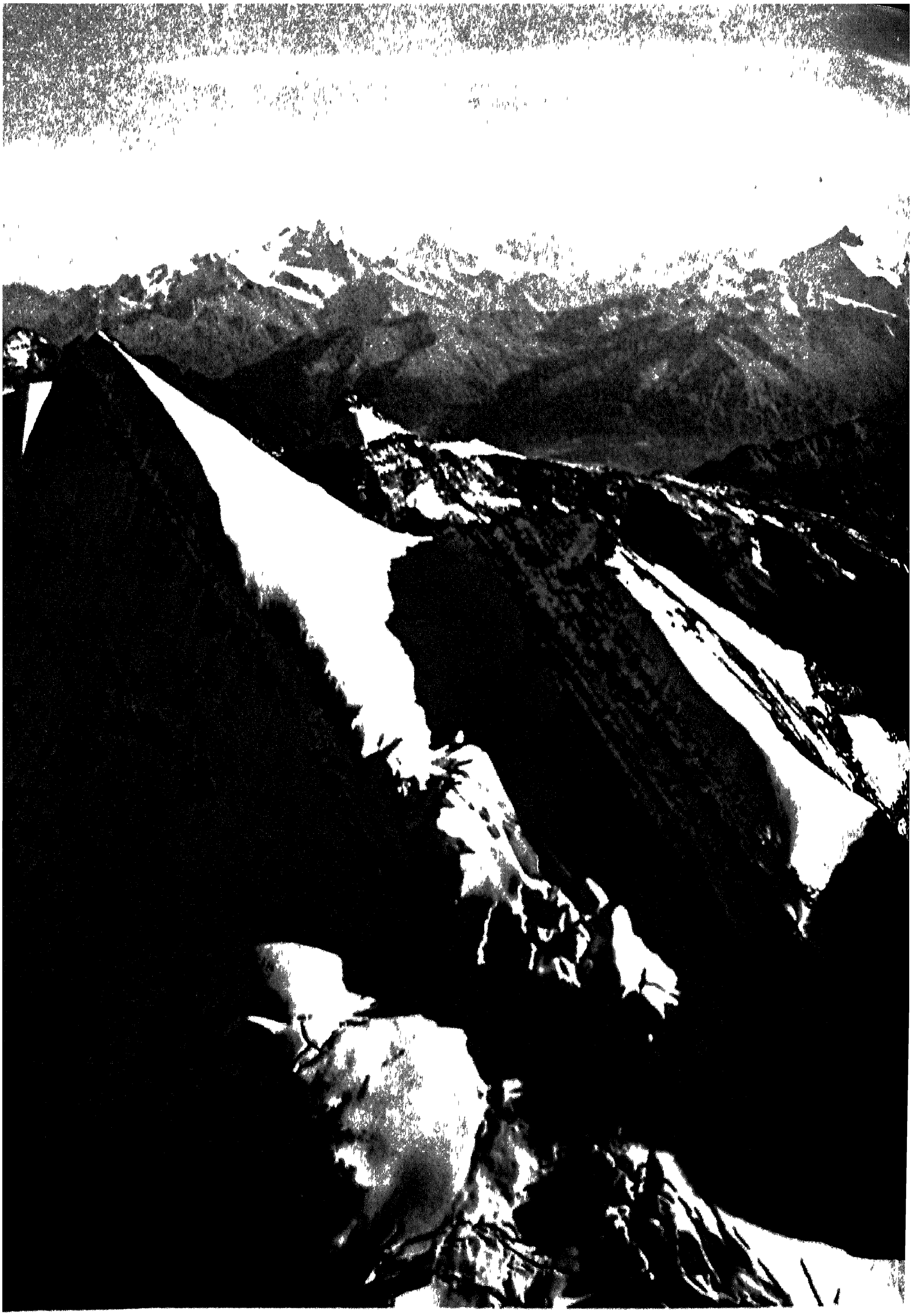
THE ALPINE SYSTEM

The Alps cover an area of about 85,000 sq.mi. The various ranges and spurs project in the form of an irregular crescent from the French-Italian coast of the Ligurian Sea (an arm of the Mediterranean Sea) between Genoa and the Rhône R.





Alps. Plate 1. *Edelweiss (above, left) is a yellow-and-white flower that grows high in the Alps. Alpine mountain climbing (above) attracts tourists from all over the world. Matterhorn (left) is a peak of the Pennine Alps on the Swiss-Italian border*



Swiss National Tourist Office

Alps. Plate 2. *Mount Doldenhorn, a peak of the Bernese Alps in Switzerland, reaches a height of 11,995 ft. The principal chain of the Bernese Alps is 68 mi. long and contains the largest number of Alpine glaciers.*

delta, to eastern Austria and northwestern Yugoslavia. The length of the Alps along the inner edge of the crescent is approximately 470 mi., and along the outer edge, about 810 mi. The width of the crescent ranges from 80 mi. near Mont Blanc (*see* BLANC, MONT), France, to 150 mi., just N. of Verona, Italy. The interior of the crescent encloses the extensive basin of the Po R. and the Adriatic Sea.

The Alps system includes hundreds of peaks, such as Matterhorn (q.v.), exceeding 10,000 ft., and in the Valais Alps of Switzerland, several peaks reach 15,000 ft. Mont Blanc (15,771 ft.) is the highest. The Alps have the most extensive glaciers of the European mainland.

In the extreme N.E., where the Alpine system reaches the Danube R., it is met by a range belonging to the Carpathian Mts. (q.v.); in the S.E. the Alps are continued by the Dinaric Alps (q.v.). In the S. the Alps meet the Apennines (q.v.), which extend through the Italian peninsula into Sicily. On the W., near Lake Bourget in France, the Alps merge with the Jura (q.v.) Mts., a separate spur of the Alpine mountain system. The term Alpine mountain system, in its structural meaning, includes the Sierra Nevada of southern Spain, the Pyrenees (q.v.), the Atlas Mountains (q.v.) of N. Africa, the Apennines, the Dinaric Alps of Yugoslavia and Greece, the Rhodope (q.v.) Mts. of Greece, the Taurus Mts. and Anatolian chains of Turkey, and the Carpathians, including the Transylvanian Alps and the Balkan Mountains (q.v.).

GEOLOGY OF THE ALPS

Structurally the Alps resulted from the folding of sediments between the Eurasian foreland and the African land mass; *see* GEOLOGY: *Formation of Mountains;* MOUNTAINS. Weathering and denudation have sculptured the Alps into the youthful forms visible today. With the exception of certain areas of S.E. Austria and of the region of Provence, France, the whole Alpine mountain system was at one time covered by ice. As temperatures became warmer, glacial action formed moraines, U-shaped valleys, pyramidal peaks, and Alpine cirques (*see* GLACIER). Denudation resulted in broad, steep-walled hanging valleys, polished boulders, and many tongue-shaped basins blocked by morainic deposits at their outward ends.

WESTERN ALPS

The Alps are commonly divided into two parts, which have very different topographic characteristics. The line of division runs S. from the Lake of Constance (q.v.), on the northern border of Switzerland, up the Rhine valley, crossing Splügen (q.v.) Pass on the Italo-Swiss border, to Lake Como (q.v.) in Italy. The western Alps are narrower and higher, with more and longer glaciers and deeply incised valleys; Mont Blanc is the highest peak. Most of Switzerland falls within the western Alps.

The ranges and ridges of the western Alps are broken and irregular, whereas in the other parts of the system the secondary ranges are commonly parallel to the axis of the system. It is further subdivided into ranges separated from one another more or less completely by stream gorges and depressions.

French Alps. The French Alps, part of the western Alps, are located in the S.E. corner of France. They are bordered on the S. by the Mediterranean coast and on the N. by the Lake of Geneva (q.v.), and extend toward the Rhône R. corridor in the W. and to the upper Po-Adriatic basin in the E. and N.E. The French Alps may be divided into the Maritime Alps, Ligurian Alps, Cottian Alps, Dauphiné Alps, Graian Alps, and Savoy Alps.

The Maritime Alps lie N. of and parallel to the Riviera (q.v.), the Franco-Italian coast of the Ligurian Sea. The chief Maritime peak is Punta Argentera (10,817 ft.) in Italy. In Liguria (q.v.), a region of northern Italy, the Maritime Alps merge with the Ligurian Alps, the chief peak of which is Monte Saccarello (7216 ft.) on the Franco-Italian border.

The Cottian Alps lie along the Franco-Italian border beyond the Maritime Alps; the highest peak is Monte Viso (12,601 ft.) in Italy. The Dauphiné Alps, a branch of the Cottian Alps, extend W. from the latter range into the Dauphiné (q.v.) region of France; the chief peak is Les Écrins (13,461 ft.) in France.

The Graian Alps extend in an arc along the Franco-Italian border from Mont Cenis Pass (*see* CENIS, MONT) on the S.W. to Little Saint Bernard Pass (*see* SAINT BERNARD) on the W.; the highest peak is Gran Paradiso (13,323 ft.) in Italy. The Savoy Alps, an extension of the Graian Alps, extend N. to the Lake of Geneva; the chief peak is Mont Blanc.

Swiss Alps. In Switzerland the Alps occupy roughly 58 percent of the surface of the country, but only about 18 percent of the population lives there. The longitudinal (E.-W.) trough of the Rhône and Rhine rivers divides the Swiss Alps into northern and southern parts. The northern Alps are usually divided into the Bernese Alps, between the Lake of Geneva and the Aare R., the Vierwaldstätter Alps, between the Aare and Reuss valleys; the Glarner or Glarus Alps, between the Reuss and Rhine valleys; and the Appenzell Alps, between the Lake of Wallenstadt and the Lake of Constance. The main chain of the Bernese Alps is 68 mi. long and has the largest number of glaciers in the Alps. The longest (16 mi.) Alpine glacier, Aletsch (q.v.) glacier, is located N of Brig in the Rhône valley; Lower Grindelwald glacier descends to the lowest elevation (3500 ft.). Finsteraarhorn (q.v.), 14,022 ft. high, is the highest peak of the Bernese Alps, and the well-known peak of the Jungfrau (q.v.), 13,642 ft., is nearby.

The southern Alps of Switzerland are divided into four main chains: the Valais Alps, or the Pennine Alps, between the Great Saint Bernard Pass (see SAINT BERNARD) and the Simplon (q.v.) Pass; the Ticino Alps and the Lepontine Alps (q.v.), which are pierced by the Saint Gotthard (q.v.) tunnel and pass; the Adula Alps, W of Splügen Pass; and the Rhaetian Alps or Grisons Alps, which cover most of Graubünden Canton and form the connecting link with the central Alps of Austria.

The Jura Mts., an extension of the western (French) Alps, extend along the Franco-Swiss border from the Rhône R. in the SW to the Rhine R. in the NE. The highest point is Crêt de la Neige (5653 ft.) in the SW part, just inside France.

EASTERN ALPS

The Alps to the E of the dividing line are broader and lower than the western Alps. Their longitudinal valleys are wider and contain a number of large cities. The highest peak is Piz Bernina (13,303 ft.) in Graubünden Canton, Switzerland. All of Austria lies in the eastern Alps. The Austrian Alps are divided by three longitudinal valley troughs into the northern limestone Alps, the central Alps, and the southern limestone Alps.

Northern Limestone Alps. The northern limestone Alps form a belt of varying width across the northern parts of the provinces Vorarlberg, Tirol, Salzburg, and Upper Austria, terminating at the Wienerwald, W of Vienna. The Alps become wider toward the E and consist of many sharp peaks, barren high plateaus, and relatively few valleys. The outer (eastern) zone, called Flysch zone, is characterized by gentle slopes and many valleys and pastures. Zugspitze (9721 ft.), the highest peak, is located NW of Innsbruck on the German border, and the highest point of the mountain lies within Germany. In Germany the Alps are limited to an outer strip of the northern limestone Alps between the Lake of Constance and Salzburg, Austria. Some of the better-known mountain chains within this division are the Allgäu Alps, Lechtal Alps, and Bavarian Alps, or North Tirol Alps.

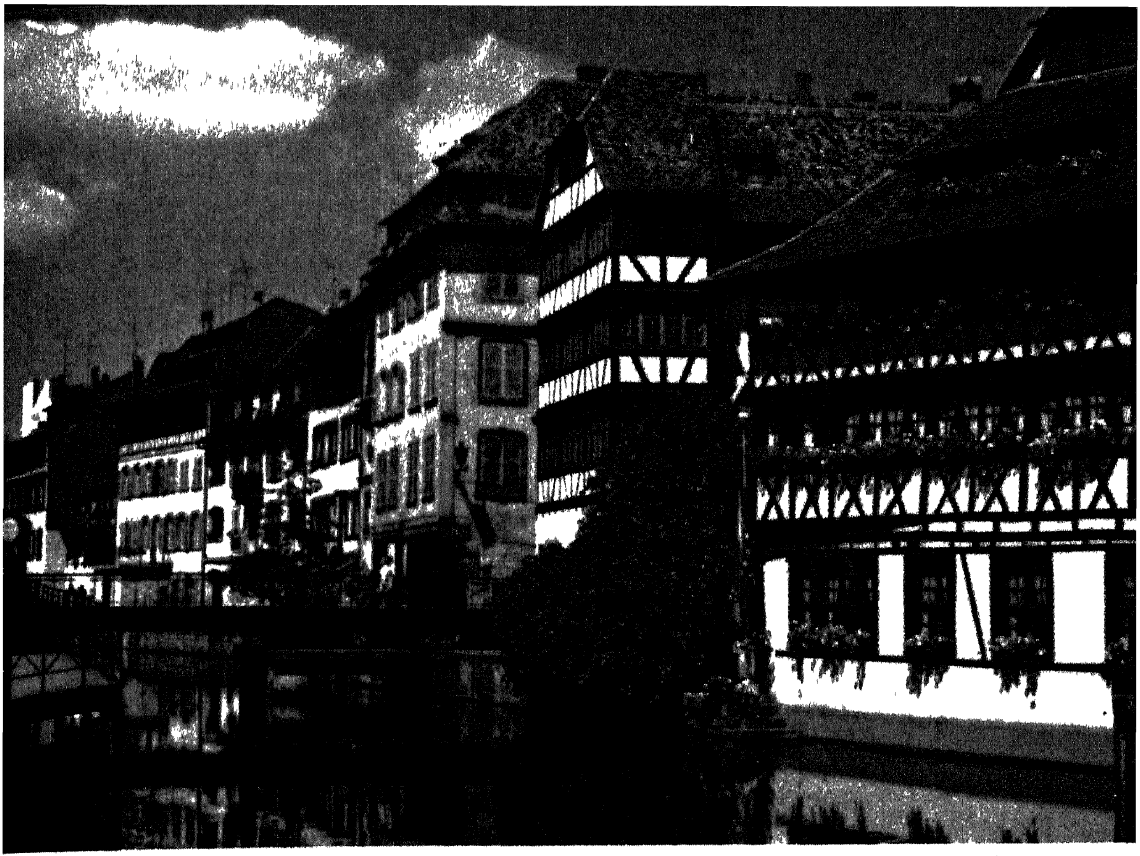
Central Alps. The central Alps of Austria are separated from the northern limestone zone by a longitudinal valley extending from the Rhine R. in Vorarlberg Province, across the Arlberg Pass to the valleys of the Inn, Salzach, and Enns rivers, and from there to the valley of the Murz R. and over the Semmering Pass to the Vienna Basin. Many transverse valleys open into this important E-W highway. The central Alps consist of numerous mountain chains, with few highways and tunnels through them; they begin at the transverse division that separates the eastern Alps from the western Alps and extend to the Noric Alps of eastern Austria. Some of the well-known mountain chains are the Otztal Alps, the Zillertal Alps and the Hohe Tauern and Niedere Tauern ranges. The highest peak is Grossglockner (12,457 ft.) near the border of Tirol, Carinthia, and Salzburg provinces.

Southern Alps. The southern longitudinal valley runs from Lake Como, Italy, along the upper Adda R. to the valleys of the Adige and Isarco rivers, and from there along the Drau R. in Austria. The Klagenfurt Basin, a densely settled and highly cultivated depression, lies between the central Alps and the southern limestone Alps, S. of which are the Carnic Alps, the Karawanken range along the Austro-Yugoslav border, the Julian Alps in Italy and Yugoslavia, and the Dinaric Alps leading SE. Generally the peaks of this zone do not attain the elevations of the central Alps. The only important through routes are offered by the valleys of the Adige, Tagliamento, and Sava rivers and, in the E, the Drava R. The Dolomite Alps (q.v.), a separate spur of limestone mountains in the inner arc of the Alps, are known for their bizarre towers and crags and for the straight white and pink walls of the mountains above the Alpine pastures.

ALPINE ROUTES

Despite the difficult terrain, the Alps offer a number of transit routes, some of which have been important since prehistoric times. Railroads follow all the important old transalpine routes, with tunnels through the most difficult stretches; it is now possible to cross any part of the Alps by train in less than four hours.

Alpine Passes. A number of relatively low passes traverse the Alps. From W to E the most important include Tenda Pass (5637 ft.) on the Franco-Italian border and Montgenèvre Pass (5562 ft.) in France, both of which are open all year; Mont Cenis Pass (6831 ft.) and Little St. Bernard Pass (7177 ft.) on the Franco-Swiss border, both of which are closed in winter. On the Italo-Swiss border in the NW bend of the crescent is the Great St. Bernard Pass (8111 ft.).



Picturesque old houses line a canal in Strasbourg, one of the chief cities of the historic region of Alsace-Lorraine. Skip Clark

Closed during the winter are Simplon Pass (6950 ft.), St. Gotthard Pass (6935 ft.), Furka Pass (7299 ft.), Oberalp Pass (6133 ft.), all of which are in Switzerland; Splügen Pass (6946 ft.) on the Italo-Swiss border; and Grossglockner-Hochtor Pass (7725 ft.). Arlberg Pass (5900 ft.), connecting the Austrian provinces of Vorarlberg and Tirol, and Brenner Pass (q.v.), 4494 ft., between the province of Tirol and Italy, are of importance for both rail and motor traffic.

Alpine Tunnels. Four important, recently opened avalanche-proof motor roads penetrate the Alps by tunnel and permit all-year passage. In order of completion they are: Great Saint Bernard Road Tunnel, 3.6 mi. long, completed in 1964, connecting Martigny, Switzerland, with Aosta, Italy; Mont Blanc Tunnel, 7.2. mi. long, completed in 1965, which shortens the route between Chamonix, France, and Courmayeur, Italy, by about 60 mi.; Felbertauern Tunnel, 7443 ft. high and 3 mi. long, completed in 1967, connecting the Austrian provinces of eastern Tirol and Salzburg; and the tunnel, 4.1 mi. long, under the San Bernardino Pass (6195 ft. high) between Hinterrhein and San Bernardino, Switzerland. *See also* TUNNEL. G.W.H.

ALSACE, European region, former German province, now comprising the French departments of Haut-Rhin, Bas-Rhin, and Territoire de Belfort. After the partitions of the empire of Charlemagne (q v.), King of the Franks, in 817 and 843, Alsace became at first part of Lotharingia, the kingdom of Lothair (q v.). In 925 Alsace became part of the German duchy of Swabia or Alemannia and was absorbed into the Holy Roman Empire, of which it remained a part for some 800 years. It remained a German possession until the 17th century, and during this period strong feudal principalities controlled largely by the Hapsburg (q v.) rulers of Austria emerged. A number of rich and powerful towns, such as Strassburg and Kolmar, developed in the late Middle Ages and won status as free towns or miniature republics By the terms of the Peace of Westphalia in 1648, which concluded the Thirty Years' War, Alsace was placed under the sovereignty of France; *see* WESTPHALIA, PEACE OF. Thereafter Alsace constituted a province of the kingdom of France until the French Revolution, when Alsace was split into the departments of Bas-Rhin and Haut-Rhin These departments, together with Lorraine, were incorporated into the German Empire after the Franco-German War (q.v.) of 1870–71 For subsequent history *see* ALSACE-LORRAINE.

ALSACE-LORRAINE (Ger *Elsass-Lothringen*), historic region in N E France, separated from

Germany on the E. by the Rhine R. and drained by the Moselle R. The Vosges Mts. are in the E. It consists of the departments of Bas Rhin, Haut-Rhin, Moselle, and Meurthe-et-Moselle. The chief cities are Strasbourg, Mulhouse, Metz, and Nancy.

After the breakup of the empire of the Holy Roman emperor Charlemagne (q.v.) in the 9th century, the region became the object of disputes between French and Germanic rulers, passing from the control of one to the other. The term Alsace-Lorraine was first used in 1871, when, by the terms of the Peace Treaty of Frankfurt concluding the Franco-German War (q.v.), the former provinces of Alsace and Lorraine (qq.v.), which had been under French rule since the middle of the 17th century, were annexed by Germany. They were returned to France in 1919, after World War I, by the terms of the Treaty of Versailles; *see* VERSAILLES, TREATY OF. During World War II, under the terms of the armistice of 1940 between France and Germany, the territory was ceded to Germany, but France regained it after the defeat of Germany in 1945.

The German-speaking population is centered chiefly in Alsace; the French-speaking, chiefly in Lorraine. In many respects, however, the culture of the whole region is uniform, containing elements of both the French and German. At various times autonomy movements have been initiated, directed against Germany between 1871 and World War I, and against France after World War I. The sentiment of the region, however, during both World Wars was markedly pro-French. G.W.H.

ALSOP, Richard (1761–1815), American writer, born in Middletown, Conn. Alsop was a member of a literary group known as the Connecticut, or Hartford, Wits. He contributed extensively to a series of satirical, anti-Republican poems, *The Echo,* published first in the periodical the *American Mercury* between 1791 and 1805 and in book form in 1807. His works include *A Poem, Sacred to the Memory of George Washington* (1800) and *Enchanted Lake of the Fairy Morgana* (1808).

ALTADENA, residential town of California, in Los Angeles Co., adjoining Pasadena on the N. and E. Pop. (1960) 40,568; (1970) 42,380.

ALTAIC, family of languages spoken by more than 75,000,000 people in a vast area of Eurasia extending from Turkey in the west to the Sea of Okhotsk in the east. It consists of three main subfamilies or groups: Turkic, Mongolic, and Tungusic. Korean, spoken by more than 32,000,000 people, is included as a fourth subgroup of Altaic by some linguistic scholars.

The Turkic languages, spoken by about 70,000,000 people, include Azerbaijani (Azerbaidzhan S.S.R. and northwestern Iran), Kazak and Kirghiz (steppes of central Asia), Turkish or Osmanli (Turkey), Turkoman (chiefly Turkmen S.S.R., Uzbek S.S.R., Kazakh S.S.R., and the Kara-Kalpak A.S.S.R.), Uighur (Sinkiang-Uighur Autonomous Region, China), Uzbek (Uzbek S.S.R.), and Yakut (mainly Lena R. basin, northeastern Siberia). The Mongolic languages, spoken by about 5,000,000 people, include Buryat (eastern Siberia), Kalmuck (chiefly the Kalmuck A.S.S.R.), and Mongolian (Mongolian People's Republic and the Inner Mongolian Autonomous Region of China). Tungusic, which consists of Goldi (along the Amur R., Siberia), Lamut (near the Sea of Okhotsk), Manchu (the region of Manchuria in China), and Tungus (eastern Siberia), is spoken by less than 200,000 people.

Altaic languages, like the Uralic (q.v.), another large, mostly north, Eurasian language family, are generally characterized by an agglutinative type of suffixation, vowel harmony, that is the vowels of the suffixes have the same coloring, front, back, and sometimes middle, as the vowel of the root to which they are appended, and lack of grammatical gender. *See* GRAMMAR, PHILOLOGY.

Certain Altaic speaking peoples are important historically, for example, the nomadic Huns and Mongols (qq.v.), who invaded Europe between the 4th and 13th centuries A.D., spread their languages as far west as the Balkans and Poland, and the Manchus of the Ch'ing dynasty ruled China (q.v.) from 1644 to 1912. *See* URAL-ALTAIC LANGUAGES. M.P.

ALTAI MOUNTAINS. *See* ALTAY MOUNTAINS.

ALTAR (Lat. *altare,* from *altus,* "high"), raised structure on which religious sacrifices are offered. The altars in ancient Christian churches were usually made of wood. In the Jewish temple two altars were used, one for sacrifices and another for incense. The Jewish and Oriental altars were generally either square or oblong; those of Greece and Rome were often round. Among the famous Italian altars are those found in the Church of Santa Maria Maggiore in Rome, the *pala d'oro* in Saint Mark's Cathedral, Venice, and the altar in the Church of Saint Ambrogio, Milan. Among noted French altars are those of the Cathedral of Clermont-Ferrand and the Church of Saint Julien of Brioude.

ALTAY MOUNTAINS, *or* ALTAI MOUNTAINS, mountain range extending from the headwaters of the Ob' and Irtysh rivers, in the S.W. part of the U.S.S.R., into Sinkiang-Uighur Autonomous Region of China, and into Mongolia The highest peak of the range is Mt Belukha (15,157 ft) Below 6000 ft. the slopes of the mountains are thickly covered with trees, including cedar, pine, larch, fir, and birch Between the forests and the snow line, which varies between 8000 and 10,000 ft., are alpine pastures The mountains are rich in minerals, especially coal, zinc, and lead, with some gold, iron, copper, silver, and tin

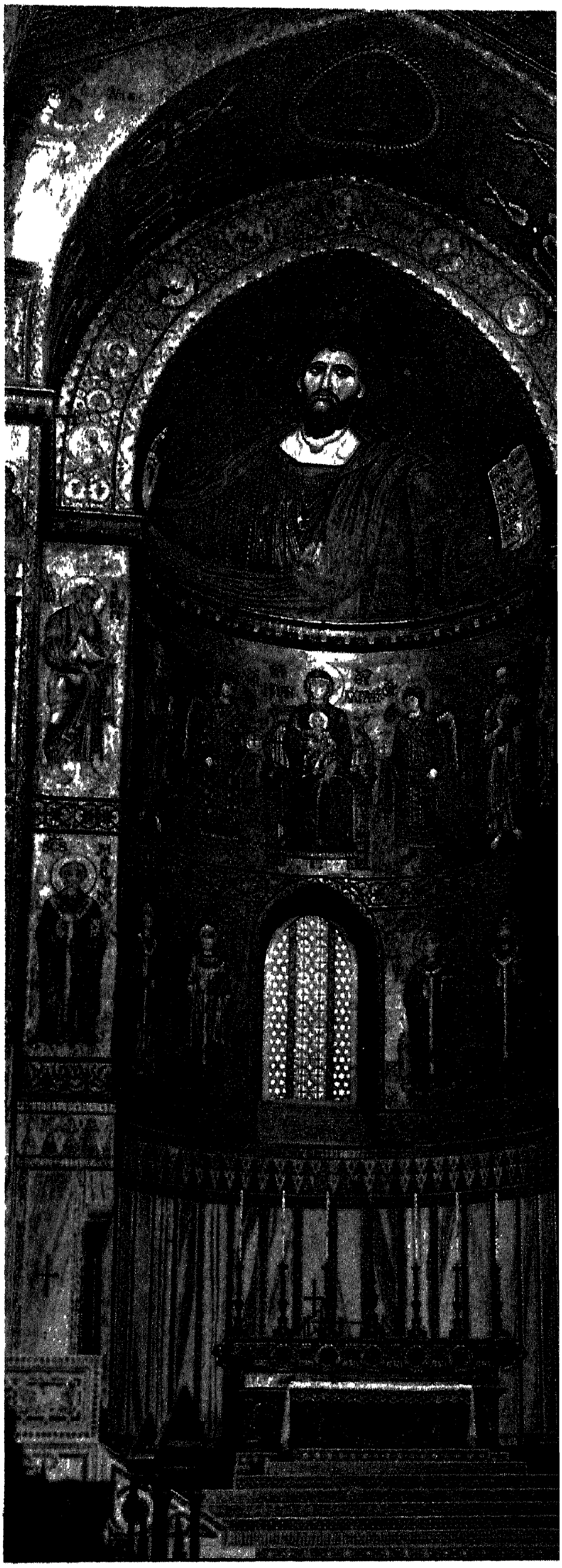
ALTAY TERRITORY, region in the Soviet Union, and administrative division of the Russian S.F S.R., in western Siberia The dominant features of the terrain are the foothills of the Altay Mts and the Kulunda, a region of steppe The territory is drained by the upper reaches of the Ob' R The territory is rich in natural resources including timber, mineral deposits, and large tracts of arable black soil Among the major crops are sugar beets, wheat, and flax Lead, tungsten, and mercury are mined Other leading industries are lumbering, livestock raising, dairying, and the manufacture of sugar, flour, textiles, and chemicals. The Gorno-Altay Autonomous Region is situated within the territory. Barnaul (q.v.) is the administrative center. Altay Territory, one of the most densely populated areas of Siberia, was settled in the early 18th century. It was designated a territory in 1937 Area, 101,000 sq.mi.; pop. (1970 est.) 2,670,000.

ALTDORF, town in Switzerland, and capital of Uri Canton, about 55 miles S.E. of Bern. According to legend, it was the home of the Swiss patriot William Tell (q.v.) The spot on which his son stood is marked by a bronze statue. Pop. (1970) 8647.

ALTDORFER, Albrecht (about 1480–1538), German painter, architect, and copper- and wood-engraver. Although his birthplace is unknown, he spent most of his life in Regensburg (q.v.) as city architect and life member of the city council.

Altdorfer is important to the history of painting as a founder and leading master of the Danube school. His pictures are characterized by an evocative imagination, ranging from the playful to the grandiose and from the picturesque to the fantastic. He produced some of the earliest pure landscapes of European art, in which nature was portrayed as both fanciful and realistic. Although his drawing is structurally weak, Altdorfer is unsurpassed as a colorist.

One of his best works is a great altarpiece (1518) in the monastery of Saint Florian in Enns, Austria. His famous "Victory of Alexander at Arbela" (1529) so captivated the French emperor Napoleon I (q.v.) that he ordered it taken to



The altar in the apse of the Cathedral of Monreale in Sicily is a characteristic example of Byzantine art.

Scala

Paris. Later it was returned to the Pinakothek in Munich, Germany, which also possesses, among other works, Altdorfer's exquisite little "Saint George in a Landscape" (1510) and "Susanna's Bath" (1526). Paintings by Altdorfer in the Berlin Museum include "Repose on the Flight to Egypt" (1510), "Beggary Sitting on the Train of Pride" (1531), and a "Nativity" (about 1512).

Altdorfer's skill as a graphic artist entitles him to a place among the so-called Little Masters, a group of 16th-century German engravers noted for their expert execution of designs on a small scale. His graphic style was influenced by the German painter and engraver Albrecht Dürer (q.v.). Altdorfer's prints include an outstanding series of nine etched landscapes. R.S.M.

ALTERNATION OF GENERATIONS, occurrence of two or more alternating forms in the life cycle of plants. All but the simplest of plants undergo a life cycle of two kinds of generations. Among the algae (q.v.) two variations of this cycle are found: (1) a life cycle in which the two generations are similar in structure and appearance, and (2) one in which the two generations are completely different. In other plants higher than algae the two generations are fundamentally different in structure and appearance.

In all cases, the alternating generations are a sexual one, called the gametophyte, and an asexual one, called the sporophyte. The gametophyte generation produces gametes (eggs and sperm) which fuse (*see* FERTILIZATION), giving rise to the sporophyte generation. The essential characteristic of the sporophyte is that its reproductive cells or spores are asexual; each spore germinates to produce a gametophyte.

Among the mosses (q.v.) and liverworts (*see* HEPATICAE) the gametophytic generation is the conspicuous form; the sporophyte cannot exist independently. The sporophyte of the moss is composed of a capsule, which is the center of spore formation; a stalk; and a foot that attaches the sporophyte body to the tip of the gametophyte.

The gametophyte and the gametes that it produces are both haploid, that is, they contain half the number of chromosomes that is characteristic of the species. When the egg and sperm fuse, they form a diploid sporophyte, that is, it has twice the haploid number of chromosomes. When the process of meiosis occurs within the sporangia of the sporophyte the diploid chromosome number is reduced again to the haploid state. *See* CELL: *Cell Division.*

Among plants higher than the ferns, such as pines, cycads (*see* CYCADACEAE), and flowering plants, the gametophyte does not occur as an independent plant. The sporophyte is the conspicuous generation, and the vestigial gametophytes are reduced to a few nuclei that can be seen only with a microscope. Among the flowering plants the pollen grain is the microspore, within which are produced sperm nuclei or male gametophytes. The egg sac, or female gametophyte, is produced by germination of a megaspore within the ovary or pistil of the flower. Microspores and megaspores are produced by meiosis, within the anther sacs of stamens and within the ovulary tissues of the pistil, respectively. *See* FLOWER: *Parts of a Flower.*

For some years scientists have known that some sporophytes spontaneously give rise to gametophytes, which are therefore diploid. Experimentally disturbed gametophytes may also give rise to sporophytes, which may then be haploid. These unusual conditions have caused scientists to question the validity of earlier conclusions about the significance of the life cycle of plants. Animals do not undergo alternation of generations that differ in chromosome number. Among the Coelenterata (q.v.), however, is found a kind of alternation of generations between a colonial polyp form and a free-swimming jellyfish or medusa form. Both forms are diploid. This cycle is known as metagenesis and is not really comparable to the alternation of generations among plants.

ALTGELD, John Peter (1847–1902), American political leader, born in Germany. He was brought to the United States as an infant by his parents, who settled near Mansfield, Ohio. At the age of sixteen he joined the Union army and fought until the end of the American Civil War. Altgeld studied law and became an attorney. He was elected a judge of the Cook County, Ill., Superior Court in 1886. A member of the Democratic Party, he was governor of Illinois from 1893 to 1897. During his administration he aroused bitter criticism throughout the country because he pardoned the anarchists involved in the bomb-throwing that took place in the Haymarket Square Riot (q.v.) in Chicago in 1886; Altgeld considered the conviction of the men unjust. In 1895, during the Pullman strike, when the American Railway Union tied up all rail transportation in Illinois, Richard Olney (1835–1917), Federal attorney general, sent troops to keep the trains running (*see* STRIKE). Altgeld protested vigorously to President Grover Cleveland (q.v.) against the use of Federal troops in a case in which the State militia was in control of the situation. This action of the governor was also widely condemned as being dangerously radical. In the Presidential campaigns of 1896 and

1900, Altgeld actively supported the candidate of his party, William Jennings Bryan (q.v.) In keeping with his liberal political and economic ideas, Altgeld was an advocate of prison reform He is the author of *Our Penal Machinery and Its Victims* (1884)

ALTHAEA. *See* HOLLYHOCK

ALTHING (Icelandic, *allr,* "all", *thing,* "assembly"), Icelandic parliament. It is older than any legislative assembly of Europe, having been established in about 930 With the exception of a period between 1798 and 1874, the parliament has functioned continually since the 10th century *See* ICELAND: *History*

ALTITUDE, in astronomy, the height in degrees of a heavenly body above the horizon An altitude measurement is not a linear distance, but rather the angle between the plane of the horizon and a line drawn from the eye to the heavenly body, or the arc of a vertical circle intercepted between the heavenly body and the horizon. Altitudes are measured in observatories by means of a telescope attached to a vertical circle on which degrees are marked. With the telescope aimed at the heavenly body, the angle that the telescope makes with the horizon is read from the graduated circle The altitude thus observed is corrected for such factors as parallax (q v.) and refraction (*see* OPTICS) in order to obtain the true altitude.

In physical geography, altitude refers to elevation above mean sea level, as indicated, for example, by the heights of mountains This measurement is determined most accurately by triangulation with optical instruments; *see* TRIGONOMETRY The altitude of an airplane, however, is measured most accurately by means of a radio altimeter, an instrument which relies on radar (q.v.) and is considerably more accurate than a conventional altimeter; *see* NAVIGATION: *Electronic Aids to Navigation.*

ALTITUDE SICKNESS. *See* AVIATION MEDICINE: *Physiological Considerations in Flight: Altitude Sickness.*

ALTMAN, Benjamin (1840–1913), American merchant, art collector, and philanthropist, born in New York City. After a public-school education, he worked in the small store established by his father in the Lower East Side. Altman worked in small stores after the death of his father, but in 1865 he opened a dry goods store of his own in New York City. His business steadily increased in scale and became one of the largest department-store enterprises in the world; in 1913, it was incorporated under the name of B. Altman & Co. Altman's art collection, valued by experts at $15,000,000 at the time of his death, was bequeathed to the Metropolitan Museum of Art in New York City.

ALTO. *See* CONTRALTO

ALTON, city of Illinois, in Madison Co, on the Mississippi R, about 8 mi above its confluence with the Missouri R., about 70 miles SW of Springfield, and about 25 miles N of Saint Louis, Mo Alton is linked with St Louis and Saint Charles, Mo, by bridges that cross both rivers. A leading industrial and commercial center of the Mississippi valley, Alton is served by several railroads Flour mills, oil refineries, lead and other ore refineries, and one of the largest bottle-manufacturing plants in the world are among the industrial establishments in Alton Dairy farming, the growing of small grains, and limestone quarrying are important industries in the surrounding area. Near Alton are the Edwardsville campus of Southern Illinois University (q v), Principia College (1898) at Elsah, and Monticello Junior College (1835) for women at Godfrey Alton was laid out in 1817 and was incorporated as a city in 1837. Pop. (1970) 39,700

ALTOONA, city of Pennsylvania, in Blair Co, about 100 miles E of Pittsburgh Altoona houses some of the largest railroad shops in the world, which are owned by the Penn Central Railroad Although primarily a railroad community, Altoona has diversified manufacturing industries and is a business center for the surrounding farming and coal-mining region Other industries in Altoona are the manufacture of textiles, clothing, shoes, glass, paper, foodstuffs, drugs, electronic tubes, plastics, computers, and printing supplies. Near Altoona, on the main line of the Pennsylvania division of the Penn Central, is the famous Horseshoe Curve, at which the railroad ascends the Allegheny Plateau. Altoona was founded in 1849 as the base of operations for the building of the first railroad over the Alleghenies In the city is a branch of the Pennsylvania State University Near the city is the site of Fort Roberdau, built in 1778 during the American Revolution, and the site of a massacre by Indians in 1781. Altoona was incorporated as a city in 1868 Pop. (1960) 69,407, (1970) 62,900.

ALTRUISM, devotion to the welfare of others It is the English form of the French word *altruisme* created by the 19th-century French philosopher and sociologist August Comte (q.v.) from the Italian *altrui,* "of or to others" Introduced into English by the translators and followers of Comte, the word has gradually come into more general use. Altruism, as a term used in philosophy, describes a theory of conduct that aspires to the good of others as the ultimate end for any moral action. Egoism and selfishness are antonyms of the word. *See* ETHICS, UTILITARIANISM.

ALTUS, city in Oklahoma, and county seat of Jackson Co., about 130 miles s.w. of Oklahoma City. The city is the business center of a rich farming region producing cotton, small grains, livestock, and alfalfa, and is the site of Altus Junior College. Altus was founded about 1891 and was incorporated in 1901. Pop. (1960) 21,225; (1970 prelim.) 22,865.

ALUM, colorless mixed salt, $KAl(SO_4)_2 \cdot 12H_2O$, also called potassium alum, which deposits from solution in large octahedral or cubic crystals when potassium sulfate and aluminum sulfate are dissolved together and the solution is cooled. Solutions of alum are slightly acidic.

Alum is soluble in ten times its weight of water at room temperature and is very soluble in hot water. When dry crystalline alum is heated, some of the water of hydration becomes chemically separated, and the partly dehydrated salt dissolves in this water, so that the alum appears to melt at about 90° C. (194° F.). When heated to about 200° C. (392° F.), alum swells up, loses all the water and some sulfur trioxide, and becomes a basic salt called burnt alum. A substance called neutral alum is produced when an alum solution is neutralized either with sodium carbonate or with aluminum hydroxide.

Alum was probably known in pre-Christian times. Until about 1600 it was made by heating a mineral, alunite, and extracting the product with water, yielding a solution of alum and a residue of alumina. In later times more common minerals were used, which required treatment with sulfuric acid or potash to produce alum. At present alum and related substances are prepared from aluminum sulfate, which is made from bauxite and sulfuric acid.

Aluminum sulfate (sometimes incorrectly called alum) and alum are similar in their properties and have similar uses. Aluminum sulfate is used as a mordant in dyeing, as a flocculating agent in the purification of water and sewage, in the sizing of paper, and in the manufacture of plaster and textiles. Where a very pure product is desired, alum is substituted; it is used in the flame-proofing of textiles, in baking powders, in mordants for delicate dyeing operations, and in medicines. It is a powerful astringent and styptic; the ordinary styptic pencil used by shavers to stop bleeding from small cuts is usually made entirely of alum. Neutral alum sometimes replaces alum as a mordant, and burnt alum is sometimes used in medicine.

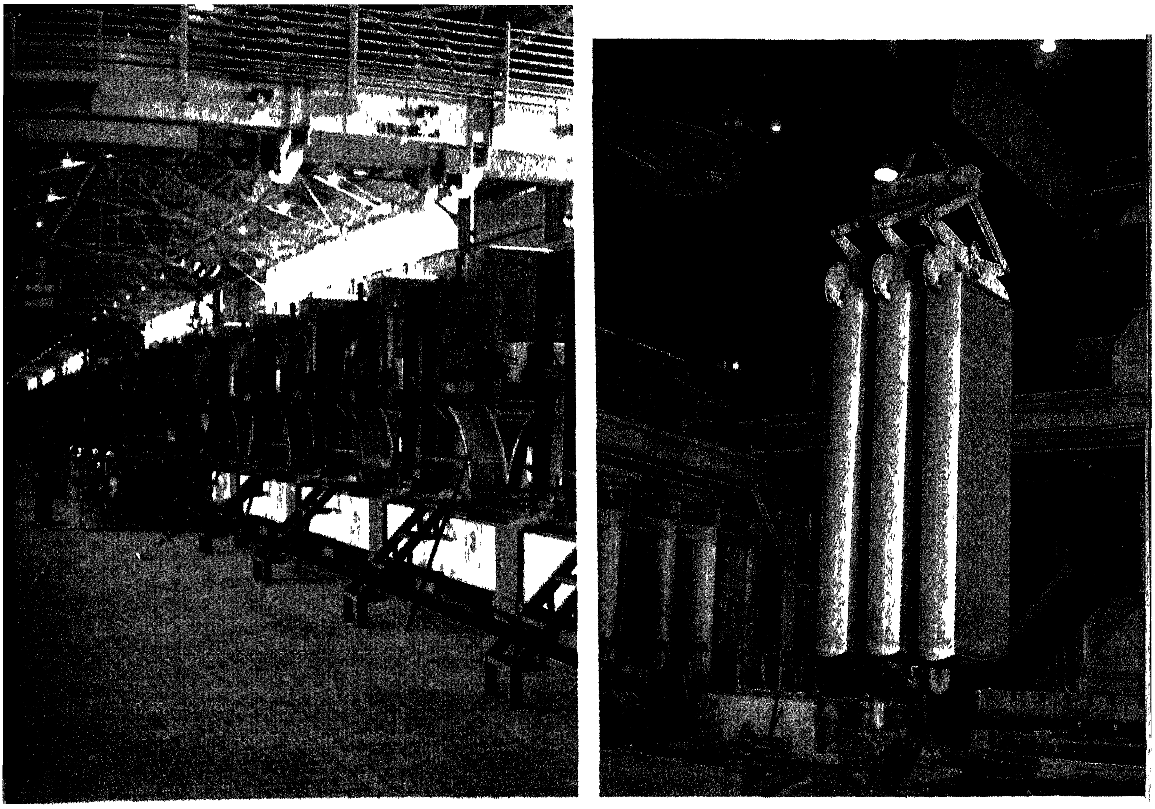
A hot solution of alumina in sodium hydroxide is cooled in a precipitation tank to form hydrated crystals of alumina

ALCOA

ALUMINA *or* **ALUMINUM OXIDE,** Al_2O_3, also called aluminum trioxide or aluminum sesquioxide, the only oxide formed by the metal aluminum. It is found in nature as the minerals corundum, Al_2O_3, diaspore (qq.v.), $Al_2O_3 \cdot H_2O$; gibbsite, $Al_2O_3 \cdot 3H_2O$, and, most commonly, bauxite (q.v.), an impure form of gibbsite. The precious stones ruby and sapphire (qq.v.) are composed of alumina colored by small amounts of impurities.

Fused alumina, alumina that has been melted and recrystallized, is identical in chemical and physical properties with natural corundum. It is exceeded in hardness only by the diamond and by a few synthetic substances, notably carborundum. Both impure natural corundum (emery) and pure synthetic corundum (alundum) are used as abrasives (see ABRASIVE). At room temperature alumina is insoluble in all ordinary chemical reagents. Its melting point is high, slightly above 2000° C. (3632° F.), and so alumina is useful as a refractory, for example, for the linings of special furnaces.

Alumina can be purified by fusing it with sodium carbonate. The resulting sodium aluminate is dissolved in water, leaving impurities, such as iron, as an insoluble residue. Hydrated alumina is reprecipitated from the solution by carbon dioxide. Because the alumina contained



A mixture of alumina and cryolite is placed in electrolytic cells (left), in which it is smelted to form aluminum. A worker watches the molten metal being tapped from one of the cells. The next step is for the molten aluminum to be poured into casting molds. Automated lifts (right) pull the cooled ingots from the molds. The resulting ingots are more than 99 percent pure aluminum.
ALCOA

in bauxite is soluble in sodium hydroxide solution, a less expensive method may be used. By alternately concentrating and diluting the solution, hydrated alumina is precipitated and the sodium hydroxide may be reused without neutralization. Hydrated alumina, also called aluminum hydroxide or aluminum hydrate, has a composition approximating the formula $Al(OH)_3$, also written $Al_2O_3{\cdot}3H_2O$, which may include more or less water. It is readily soluble in acids or alkalies and is used as a raw material for the manufacture of all aluminum compounds.

ALUMINUM (in Canada and Europe, aluminium), trivalent metallic element with at.no. 13, at.wt. 26.9815, b.p. about 2450° C. (4442° F.), m.p. 659° C. (1218.2° F.), sp.gr. $2.70^{20°}$, and symbol Al. Aluminum is the most abundant metallic constituent in the crust of the earth; only the nonmetals oxygen and silicon are more abundant. Aluminum has never been found as a free metal; it occurs most commonly as aluminum silicate or as a silicate of aluminum mixed with other metals such as sodium, potassium, iron, calcium, and magnesium. These silicates are not useful ores, for it is chemically difficult, and therefore an expensive process, to extract aluminum from them. Bauxite (q.v.), an impure hydrated aluminum oxide, is the commercial source of aluminum and its compounds.

Hans Christian Oersted (q.v.), a Danish chemist, first isolated aluminum in 1825, using a chemical process involving potassium amalgam. Betwen 1827 and 1845 Friedrich Wohler (q.v.), a German chemist, improved Oersted's process by using metallic potassium. He was the first to measure the specific gravity of aluminum and show its amazing lightness. In 1854 Henri Sainte-Claire Deville (q.v.), in France, obtained the metal by reducing aluminum chloride with sodium. Aided by the financial backing of Napoleon III, Deville established a large-scale experimental plant and displayed pure aluminum at the Paris Exposition of 1855. In 1886 Charles Martin Hall (q.v.) in the United States and Paul L. T. Héroult (1863–1914) in France independently and almost simultaneously discovered that alumina (q.v.), or aluminum oxide, would dissolve in fused cryolite (Na_3AlF_6) and could then be decomposed electrolytically to a crude molten metal. A low-cost technique, the Hall-Héroult process is still the only method used for the commercial production of aluminum. The purity of the product has been increased until a commercially pure ingot is 99.5 percent pure aluminum; it may be further refined to 99.99 percent.

General Dynamics

Aluminum. *Above: A thin sheet of rolled aluminum is processed for the fuselage of an airplane. Below: Sections of preshaped aluminum are joined together to form the skin of each of the several large transport planes, shown in the final assembly area of an aircraft manufacturer.*

Douglas Aircraft Co

In 1886 the world production of aluminum was less than 100 lb., and its price was more than $5.00 per lb. In the mid-1970's the U S annual production alone was over 4,900,000 short tons of primary aluminum; its price was about 34 cents per lb. World output was more than 14,500,000 short tons in the same period. U.S. consumption of aluminum, by major markets, was as follows: building and construction, 22 6 percent; transportation, 17.8 percent; containers and packaging, 16 6 percent; electrical equipment, 13.5 percent; consumer durables, 8.5 percent; machinery and equipment, 7.6 percent; exports, 6.9 percent, and miscellaneous, 6 5 percent.

Aluminum is a strongly electropositive metal and extremely reactive. In contact with air, aluminum rapidly becomes covered with a tough, transparent layer of oxide that resists further corrosive action. For this reason, materials made of aluminum do not tarnish or rust. The metal reduces other metallic compounds to their base metals. For example, when thermite, a mixture of powdered aluminum and iron oxide, is heated, the aluminum rapidly removes the oxygen from the iron; the heat of the reaction is sufficient to melt the iron. This phenomenon is used in the thermite process for welding iron. *See* WELDING.

The oxide of aluminum is amphoteric, showing both acidic and basic properties in approximately equal degrees. The most important compounds are the oxide, hydroxide, sulfate, and mixed sulfate compounds; *see* ALUM. Anhydrous aluminum chloride is an important salt used in the oil and synthetic-chemical industries. Many gemstones (*see* GEM), ruby and sapphire, for example, consist mainly of crystalline aluminum oxide.

A given volume of aluminum weighs less than one third as much as the same volume of steel. The only lighter metals are lithium, beryllium, and magnesium. Its high strength-to-weight ratio makes aluminum useful in the construction of aircraft, railroad cars, and automobiles and for other applications in which mobility is important. More than 70 lb. of aluminum are used in the average automobile. Because of its high heat conductivity, aluminum is used in cooking utensils and in the pistons of internal-combustion engines. Aluminum has only 63 percent of the electrical conductance of copper for wire of a given size, but it weighs less than half as much. An aluminum wire of comparable conductance to a copper wire is thicker but still lighter than the copper. Weight is a particularly important factor in long-distance, high-voltage power transmission, and aluminum conductors are now used to transmit electricity at 700,000 volts or more.

The metal is becoming increasingly important architecturally, for both structural and ornamental purposes. It is also used as a material in low-temperature nuclear reactors because it absorbs relatively few neutrons Aluminum becomes stronger and retains its toughness as it gets colder and is therefore used at cryogenic temperatures. Aluminum foil 0 007 in thick, now a common household convenience, protects food and other perishable items from spoilage Because of its light weight, ease of forming, and compatibility with foods and beverages, aluminum is used increasingly for containers, flexible packages, and easy-to-open bottles and cans. Its resistance to corrosion in salt water makes it useful in boat hulls and varied aquatic devices.

A wide variety of alloys can be prepared that give the metal different properties. Some new aluminum alloys are so strong that they can be used as armor plate for tanks, personnel carriers, and other military vehicles S.Z L.

ALUMINUM OXIDE. *See* ALUMINA

ALVA, Fernando Álvarez de Toledo *or* **ALBA, Fernando Álvarez de Toledo, Duke of** (1508–83?), Spanish general of noble family He rose to prominence as commander of the armies of Charles V (q.v.), Holy Roman Emperor, and gained a brilliant victory for Charles over Elector John Frederick (1503–54) of Saxony at Mühlberg in 1547. In Charles' Italian campaign against the French and papal forces Alva overran the States of the Church, but after the abdication of Charles V, Philip II (q.v.), King of Spain, gave up these conquests. Alva was appointed captain general of the Netherlands in 1567, with authority to repress the Dutch revolt against Spain (*see* NETHERLANDS, THE: *History*). He promptly set up a tribunal, known as the Blood Council, which condemned the rebels and confiscated their property without regard to legal procedure. Among the best known victims were the Flemish statesmen Lamoral Egmont (q v.) and Philip de Montmorency Horn (1518–68). Alva's troops defeated the Flemish forces and on Dec 22, 1568, triumphantly entered Brussels. In Antwerp he set up a statue of himself trampling two figures representing the nobles and people of the Netherlands. Alva himself claimed to have caused the execution of 18,000 men. His tyranny intensified the Dutch resistance, however, and he was recalled in 1573. In 1580 he conquered Portugal with characteristic cruelty.

ALVARADO, Pedro de (1486–1541), Spanish explorer, born in Badajoz. In 1518 he accompa nied the Spanish explorer Juan de Grijalva (1489?–1527) on his voyage along the coast of Mexico. In February, 1519, he was second in command to the Spanish adventurer Hernando Cortes (q.v.) on their voyage to Havana, Cuba and took an active part in the conquest of Mexico. In 1520, while he was in charge of Mexico City in the absence of Cortes, the Mexicans revolted and forced Alvarado to retreat. Alvarado is said to have saved his life only by leaping a great gap in the causeway, a spot still called Alvarado's Leap. He conquered and settled Guatemala in 1523 and in 1534 headed an expedition to claim the territory of Quito, maintaining that it had not been included in the grant made to the Spanish conqueror of Peru, Francisco Pizarro (q.v.). Shortly after landing he was met by Pizarro's troops and agreed to turn back upon the payment of a large indemnity. Alvarado was later engaged in the conquest of Honduras; he was killed during an Indian rebellion in Mexico.

ALVAREZ, Luis Walter (1911–), American physicist, born in San Francisco, Calif. He was educated at the University of Chicago, from which he received a Ph.D. degree in 1936. He was a research fellow at the Radiation Laboratory (later named the E. O. Lawrence Radiation Laboratory) of the University of California at Berkeley, and helped design the laboratory's cyclotron (q.v.). At Massachusetts Institute of Technology from 1940 to 1943, Alvarez developed radar systems. He did research at the Los Alamos Scientific Laboratory from 1943 to 1945. Since 1945 he has been professor of physics at Berkeley. He is noted for cosmic-ray research and for the development of the liquid-hydrogen bubble chamber, with which his research group has discovered a large number of fundamental particles. Alvarez received the Medal for Merit in 1948, and the National Medal of Science in 1964 for research in high-energy physics. In 1968 he received the Nobel Prize in physics for his work in subatomic particles.

ÁLVAREZ QUINTERO, Serafín *and* **ÁLVAREZ QUINTERO, Joaquín.** *See* QUINTERO, SERAFÍN ÁLVAREZ *and* QUINTERO, JOAQUÍN ÁLVAREZ.

ALWAR, city of the Republic of India, in Rajasthan State, and capital of Alwar District, about 80 miles S.W. of Delhi. The city, which is circled by a wall and moat, has several fine palaces and temples and a library containing rare Oriental manuscripts. Before the partition of India in 1947, Alwar was the capital of Alwar, a princely state. Pop. (1971) 100,378.

ALYATTES (609?–560 B.C.), King of Lydia (q.v.), and founder of the ancient Lydian Empire. Under Alyattes the Lydians fought with many nations. After a war with the Medes (*see* MEDIA), his power extended to the river Halys (modern Kizilirmak) in Asiatic Turkey. He drove the Cimmerians (q.v.) out of Asia Minor and took their lands, and he also conquered the Ionian cities of Smyrna (now Izmir) and Colophon. His tomb was one of the wonders of antiquity; its remains, not far from the river Hermus (modern Gediz), north of Sardis, were excavated in 1854. Alyattes was succeeded by his son, the famous Croesus (q.v.), last king of Lydia.

ALYSSUM, genus of low growing, mostly perennial plants of the Mustard family (Cruciferae), commonly called madwort. *A. saxatile*, golden tuft or rock madwort, and *A. argenteum*, yellow tuft, are spring flowering perennials often cultivated in rock gardens. A related plant of the same family, *Lobularia maritima*, is commonly called sweet alyssum. It is a European perennial, cultivated in the United States as an annual, and used mainly as an edging for flower gardens. The clusters of white flowers bloom throughout the spring and summer and have a pleasant fragrance. Blue and purple varieties also have been introduced. The name (Gr. *a*, "not", *lyssa*, "madness") refers to the ancient Greek belief in the potency of alyssum as a cure for hydrophobia; *see* RABIES.

ALY SULEIMAN KHAN (1911–60), son of Aga Khan III and father of Aga Khan IV (*see under* AGA KHAN). Aly Khan divorced his first wife, the mother of Aga Khan IV, in 1949 and married the American motion picture actress Rita Hayworth (1918–) the same year. That marriage also ended in divorce, in 1953. From 1958 until his death Aly Khan was Pakistani representative to the United Nations.

AMADEUS, in full AMEDEO FERDINANDO MARIA DI SAVOIA (1845–90), Duke of Aosta and King of Spain (1870–73), born in Turin, Italy. He was the second son of King Victor Emmanuel II (*see under* VICTOR EMMANUEL) of Italy. On Nov. 16, 1870, the Cortes, or national legislature, of Spain elected him king, and on Dec. 4 Amadeus accepted the crown. From the beginning Amadeus was highly unpopular among the Spanish people and the year after he reached Madrid, uprisings against him took place. He abdicated on Feb. 11, 1873, and returned to Italy. *See* SPAIN: *History*.

AMADIS OF GAUL, title of a medieval romance of chivalry, written in prose and relating the adventures of a legendary hero of the same name. Its authorship is sometimes credited to the Portuguese knight Vasco de Lobeira (1360?–1403). The story was published (1508) in four books by Garcia Ordóñez de Montalvo (fl. 16th cent), who claimed that he revised the first three books from 14th-century versions and wrote the fourth himself. *Amadeus of Gaul* has been translated into numerous languages.

AMAGASAKI, city and seaport of Japan, in Hyogo Prefecture, on Honshu Island, on the Yodo R. and Osaka Bay, just N.W. of Osaka. It is an industrial center, manufacturing iron and steel products, chemicals, textiles, glass, pottery, drugs, dyes, and woodwork. Other industrial installations are breweries, machine shops, and shipyards. The principal exports include drugs, dyes, metal products, and pottery. An important part of the Osaka-Kobe industrial complex, the city was raided by United States bombers late in World War II. Pop. (1970) 554,000.

AMALEKITES, in antiquity, warlike, nomadic tribe of southwestern Palestine. An inveterate hostility existed between the tribe and the Israelites, whose king, Saul (q.v.), nearly annihilated the Amalekites in the 11th century B.C. David (q.v.), King of Israel, later defeated them in a dreadful slaughter. David crushed a later uprising and the descendants of the survivors were finally exterminated in the days of Hezekiah (q.v.), King of Judah, by the Simeonites.

AMALFI, picturesque town of Italy, in Salerno Province, Campania Region, 24 miles S.E. of Naples. Beautifully situated on limestone cliffs, it overlooks the Gulf of Salerno. The town is the seat of an archbishop.

Today Amalfi is a small fishing port and tourist resort. In the 9th century, however, it was a powerful maritime republic, competing with Venice, Pisa, and Genoa in trade and sending its ships as far as India. Its maritime code, one of the earliest known, was widely recognized around the Mediterranean basin until well into the 16th century. After the 12th century, when Amalfi was annexed by King Roger II of Sicily (1131) and then sacked by the Pisans (1135 and 1137), it gradually declined as a commercial and naval power.

One of Amalfi's chief points of interest is the cathedral, which was begun in the 9th century and repeatedly remodeled. Especially admired are its splendid bronze doors, cast in Constantinople in about 1066. Another notable site is an old Capuchin convent, founded in 1212 and now used as a hotel. Amalfi is renowned for its natural beauty. Pop. (1971) 6136.

AMALGAM. *See* MERCURY.

AMALGAMATED CLOTHING WORKERS OF AMERICA, trade union affiliated with the American Federation of Labor and Congress of Industrial Organizations (q.v.), the principal union for workers in the field of men's and boys' clothing, cotton garments, gloves, and underwear and in a number of local laundry, cleaning, and dyeing establishments. Within all these industries it has introduced a comprehensive system of health, life, accident, maternity, and hospitalization insurance, and old-age retirement benefits for its members. Its achievements include the reduction of working hours from 70 to 80 a week to 36, paid vacations and paid holidays, and the setting up of machinery for impartial arbitration of disputes with management. The union has pioneered in cooperative housing, labor banking, and other projects for the improvement of social conditions. It originated as a group seceding from the United Garment Workers' Union in 1914, under the leadership of Sidney Hillman, who was president of A.C.W.A. until 1946. Jacob S. Potofsky (1894–) was president from 1946 to 1972 and was succeeded by the vice-president Murray Finley (1922–). The 1971 membership in the United States, Canada, and Puerto Rico was 375,000.

AMANA SOCIETY. *See* COMMUNISM: *Early American Experiments in Communism.*

AMANITA. *See* MUSHROOM: *Poisonous Mushrooms.*

AMARANTH, common name for any flowering plants with blossoms that do not readily fade when picked, and especially to plants of the genus *Amaranthus*. The genus contains about fifty species, most of which are found in the tropics. They are herbs or shrubs, with simple leaves, and flowers in heads or spikes. The spikes are sometimes several feet in length. Because the dry red bracts which surround the flower retain their freshness long after the flowers are gathered, poets regard the plant as a symbol of immortality. The annual weeds, pigweed (*A. retroflexus*) and tumbleweed (*A. graecizans*), of the United States are of this genus. The globe amaranth, *Gomphrena globosa,* is cultivated in Roman Catholic countries for adorning churches in winter. Its flowers, which are a shining purple color, retain their beauty and freshness for several years. *See* EVERLASTINGS.

AMARILLO, city of Texas, in Potter and Randall counties, county seat of Potter Co., and the largest city in the Panhandle area, about 305 miles N.W. of Ft. Worth. It is served by four airlines and by three railroad lines. The surrounding region produces cattle and grain and has oil, natural gas, and helium fields. Amarillo contains railroad shops, foundries, zinc smelters, and the largest helium plant in the world. The city was incorporated in 1887. Pop. (1960) 137,969; (1970) 127,010.

AMARYLLIS, genus of bulbous rooted herbs of the Amaryllis family (*Amaryllidaceae*), embracing a large number of species, native to the tropical regions. The most common species is the belladonna lily, *Amaryllis belladonna*, a South African plant with showy, lilylike flowers. Many horticultural forms are grown with flowers ranging in color from white to red in diverse shapes and sizes. Another popular species is the Barbados lily, *A. vittata*, of Peru, which bears white flowers with red, feathery stripes. Both are grown outdoors in the southern United States and as pot plants in the northern States.

AMASIS. *See* AHMOSE

AMATEUR ATHLETIC UNION OF THE UNITED STATES, known as the A.A.U., national nonprofit organization founded in 1888 and comprising groups interested in the development and improvement of activities for amateur athletes. The A.A.U. defines an amateur athlete as "one who engages in sport for pleasure . . . and to whom sport is nothing more than an avocation". Membership is limited to such permanent organizations as chambers of commerce and the Young Men's Christian Association, and to high schools, colleges, and athletic clubs. The constitution of the A.A.U. includes the following objectives: to foster physical education, to conduct athletic contests and provide awards for them, to arrange international competitions, to develop sports and recreational facilities for the public, and to maintain a uniform standard for the eligibility of athletes as amateurs. For the accomplishment of these goals the A.A.U. conducts nationwide athletic competitions for boys and girls. In federations with similar organizations abroad the A.A.U. helps to set standards for such international athletic competitions as the Olympic Games (q.v.).

Among the amateur sports under the jurisdiction of the A.A.U. are basketball, bobsledding, boxing, gymnastics, handball, judo, luge (small-sled competition), swimming, track and field, volleyball, water polo, weight lifting, and wrestling. The organization has sixty-five regional associations throughout the U.S.; its headquarters are in New York City.

AMATI, family of celebrated Italian violin makers of Cremona.

Andrea Amati (1530?–1611), the founder of the Cremona school of violin makers. His model was a small violin with high back and belly, amber varnish, and a clear though weak tone.

Antonio Amati (1555–1638), and **Gerolamo Amati** (1556–1630), sons of Andrea Amati. They worked together and followed their father's style. Gerolamo also developed a larger violin with an altered sound hole.

Nicolò Amati (1596–1684), son of Gerolamo Amati. He became the most eminent craftsman of the family. His model is extremely elegant, with the backs and bellies arched and made of beautiful grained wood. The sound holes are graceful and bold, the scroll is exquisitely cut, and the varnish is transparent and of a deep, rich hue. As a rule, he used a small pattern, although he produced some large violins, which are now called grand Amatis and are highly valued. He also made a number of beautiful violas and violoncellos. The great Italian violin makers Antonio Stradivari (q.v.) and Andrea Guarnieri (see *under* GUARNIERI) were his pupils.

Gerolamo Amati (1649–1740), son of Nicolò Amati. He produced mediocre instruments and ended the leadership of the Amati name in the craft of violin making.

AMAZIAH (Heb., "whom Yahweh strengthens", 8th cent. B.C.), King of Judah from about 798 to about 780 B.C. He fought against the kingdoms of Edom (q.v.) and Israel. He defeated the Edomites in 798 B.C. but was himself overcome and taken prisoner in about 795 B.C. by Joash (q.v.), King of Israel. Amaziah was killed by conspirators fifteen years later at Lachish.

AMAZON (Port. and Span. *Rio Amazonas*), river of South America, largely in Brazil, ranked as the largest in the world in terms of watershed area, number of tributaries, and volume of water discharged. Measuring about 3900 mi. from source to mouth, it is second in length only to the Nile among the rivers of the world. With its hundreds of tributaries, the Amazon drains a territory of more than 2,300,000 sq.mi., roughly half of which is in Brazil; the rest is in Peru, Ecuador, Bolivia, and Venezuela. It is estimated that the Amazon discharges between 9,000,000 and 32,000,000 gal. of water per sec., and deposits a daily average of 3,000,000 tons of sediment near its mouth. The annual outflow from the river accounts for one fifth of all the fresh water which drains into the oceans of the world. The outpouring of water and sediment is so vast that the salinity and color of the Atlantic Ocean are altered for a distance of 200 mi. from the mouth of the river.

The major headstreams of the Amazon are the Ucayali and Marañón rivers, both of which rise in the permanent snows and glaciers of the high Andes Mts. and follow parallel courses northward before joining near Nauta, Peru. From this confluence the main trunk of the Amazon flows in a generally eastward direction to the Atlantic Ocean. The Amazon enters the Atlantic through a broad estuary, roughly estimated at 150 mi. in width. Here, delta deposits have formed a maze of islands that separate the river into branches The mouth of the main stream is 50 mi. wide. This branch, known as the Pará, is separated from a smaller branch by Marajó Island, which has an area of more than 14,000 sq.mi. During new and full moon a tidal bore (*see* BORE), or wave front from the ocean, sweeps more than 400 mi upstream at speeds in excess of 40 m p h This phenomenon often causes waves up to 16 ft. in height.

The Amazon watershed includes the largest and wettest tropical plain in the world. Heavy rains drench much of the densely forested lowland region throughout the year but especially between January and June. Seasonal variation in rainfall is reflected by the width, rate of flow, and discharge volume of the river. During the months of maximum precipitation, broad areas traversed by the Amazon are subject to severe floods. In Brazil the width of the river ranges between 1 and 6 mi. at low stage but expands to 30 mi. or more during the annual floods; the rate of flow ranges between 1.5 and 5 m.p.h.; and the crest of the water at flood time often rises 50 ft. above the norm. To drain the vast mass of water, the Amazon has carved a deep bed in the plain through which it flows. In one sector near Óbidos, Brazil, the bed of the river is more than 300 ft. below the average surface level of its water.

Because of its vastness, annual floods, and navigability, the Amazon is often called the "Ocean River" The total number of its tributaries is as yet uncounted, but there are more than 200 in Brazil alone. Seventeen of the largest known tributaries are more than 1000 mi. in length. The Amazon proper is navigable to ocean liners of virtually any tonnage for two-thirds of its course. Transatlantic ships dock regularly at Manaus, nearly 1000 mi. upstream; and ships of 3000 tons can reach Iquitos, Peru, 2300 mi. from the river's mouth, the farthest point from sea of any port serving ocean traffic River steamers of more modest tonnage can navigate on more than one hundred the larger tributaries.

The delta region of the Amazon may have been discovered by Vincente Yáñez Pinzón (q.v.) in 1500, but exploration did not begin until 1540–41, when an expedition led by Francisco de Orellana (q.v.) started down the Napo R, in what is now Ecuador, and reached the Atlantic Ocean. Pedro Teixeira undertook the first upstream voyage. Between [illegible]7, and August, 1638, he ascended the source of the Napo R. and crossed the Andes to Quito, Ecuador Later, he returned by the same route In modern times the river has been explored by many scientific expeditions, including that led (1914) by Theodore Roosevelt (q v.) and others sponsored by the National Geographic Society (q v.) and the government of Brazil

Some authorities believe that the river was named after the Amazons (q v.), women warriors of Greek mythology who were thought to reside in the region; other scholars insist that the name is derived from the Indian word *amassona* ("boat destroyer")

Despite centuries of effort to overcome the dominance of nature, man has made little impact on the Amazon and most of its vast drainage basin No bridge spans the river Except near its mouth, the Amazon watershed constitutes one of the most thinly populated regions in the world Much of the territory drained by the river system has never been thoroughly explored One may fly for hours over the tropical forests that cover much of the river's floodplain and see no sign of human settlement. In many stream valleys, Indian tribes hostile to strangers continue to live much as they did before the arrival of the Europeans. Most commerce is narrowly confined to the navigable sectors of the river system. The economy continues to be dominated by primitive agriculture, hunting and fishing, and the gathering of various forest products Commercial farming, tourism, mining, and industry play only a minor role in the region But particularly in Brazil, the dream of conquering nature and developing the seemingly enormous economic potential of the Amazon region is still strong.

J P.A.

AMAZONS, in Greek mythology, a race of warlike women who excluded men from their society The Amazons occasionally had sexual relations with men of neighboring states, and all male children born to them were either sent to live with their fathers or killed The girls were trained as archers for war, and the custom of burning off the right breast was practiced to facilitate bending the bow Hence the name "Amazon", derived from the Greek word for "breastless". In art, however, in which they are frequently represented, they are depicted as beautiful women with no apparent mutilation. Ancient art such as that on temple friezes, vases, and sarcophagi usually presents them in battle scenes According to legend, they were almost constantly at war with Greece and fought other nations as well. According to one version, they were allied to the Trojans and during the siege of Troy their queen was slain by the Greek warrior Achilles (q.v.). Some scholars who attribute a historical foundation to the legends identify the kingdom of the Amazons with Scythia or Asia Minor on the shores of the Black Sea.

AMBASSADOR. *See* DIPLOMATIC AGENTS.

AMBATO, city in Ecuador, and capital of Tungurahua Province, on the Ambato R., 70 miles S. of Quito. A leading commercial and transportation center and a mountain resort, the city is in a fertile region near the northern foot of Mt. Chimborazo. Ambato has frequently been damaged by earthquakes. Called the "Garden City of Ecuador", the city is known for the production of peaches, apples, grapes, pears, oranges, and strawberries. Grain, sugarcane, and vegetables are also grown. Local industries produce textiles, flour, canned fruit, leather goods, rubber, wine, and furniture. The Poet Juan Montalvo (1832–89) was born here. Nearby General Antonio José de Sucre (q.v.) won an important battle during the war for independence against Spain. Pop. (1972) 80,779.

AMBER (Ar. *anbar,* meaning "ambergris"), fossil resin that, in prehistoric times, exuded from various now-extinct coniferous trees. It is usually a yellow or yellow-brown color. It develops in round, irregular lumps, grains, or drops; has a perfectly conchoidal fracture, is slightly brittle, and emits an agreeable odor when rubbed. Amber burns with a bright flame and pleasant smell and becomes negatively electric by friction. It was obtained in antiquity from the southern coast of the Baltic Sea, where it is still found and obtained commercially by strip mining. It is also found in small quantities in Sicily, Rumania, Siberia, Greenland, Burma, Australia, and the United States. Amber is used in the arts, it is also used in the manufacture of jewelry, cigarette holders and pipestems, and in the making of varnish.

AMBERGRIS (Fr. *ambre gris,* "gray amber"; Ar. *anbar*), fatty or pitchlike substance, black or gray in color, with yellow or red striae. It is produced in the intestine of the sperm whale (see WHALE: *Toothed Whales: Sperm Whale*), apparently when the animal is sick. The horny, parrotlike beak of the cuttlefish (q.v.), the principal food of the sperm whale, is frequently found imbedded in ambergris. Ambergris is probably a secretion from the intestine of the whale that forms around the irritating, indigestible beak.

Occasionally ambergris is taken from the bowels of the sperm whale. More frequently, however, it is found floating in the Indian Ocean or other tropical waters, or cast upon the seashore, in lumps of from ½ oz. to 200 lb. The harder, more valuable, gray ambergris accumulates in the intestine of the whale, obstructing it and eventually causing the death of the animal. The softer, black variety is that which the whale has been able to eject soon after its formation. When fresh, ambergris has a strong, unpleasant smell; after exposure to the air it hardens and develops its characteristic odor, which is sweet and musty.

At one time ambergris was used as a medicinal cure-all in the Orient and in Europe, and as a flavoring for food in various Asian lands. Its greatest value now is as the best fixative in making costly perfumes; it prevents the volatile oils from evaporating too quickly. Because the demand for ambergris far exceeds the uncertain supply, the value is high. In 1955 the Swiss chemist Leopold Ružička (q.v.) developed synthetic ambergris, which is far less expensive than the natural substance.

AMBIDEXTERITY, ability of a person to perform most tasks nearly equally well with either hand. It is an uncommon skill, because usually a preference for the use of either the right or the left hand is established in childhood by about age nine or ten, with resultant primary development of skill in using that hand.

Less than 5 percent of adults show ambidexterity. This group includes individuals who evidence mixed-handedness, that is, they develop a preference for performing certain tasks with one hand and other tasks with the other. *See* LEFT-HANDEDNESS; RIGHT-HANDEDNESS. B.P.

AMBLYOPIA. *See* VISION: *Sight Defects.*

AMBOINA *or* **AMBON,** island of the Republic of Indonesia, one of the Moluccas Islands, in the Banda Sea. It is mountainous, but has a fertile and well-watered coastal plain. The chief products are cloves, nutmeg, rice, sugar, and copra, which are shipped from the port city of Amboina. The island was discovered by the Portuguese in 1512, but was captured by the Dutch in 1605 and held almost continually by them until 1949, when Indonesia gained independence. The inhabitants of Amboina led a brief revolt against Indonesia in 1950. Area, about 314 sq.mi.; pop. about 790,000.

AMBOISE (anc. *Ambacia*), town of France, in the Indre-et-Loire Department, on the Loire R., about 14 miles E. of Tours. The town is in a wine-producing region called the Garden of France. Boots and shoes, steel, iron products, and textiles are manufactured in Amboise. After 1431 the castle of Ambois was frequently used as a royal residence. Pop. (1968) 8192.

Ocean. **ISE, Georges d'** (1460–1510), French prelate and statesman, born in Chaumont-sur-Loire From 1493 to 1498 he was archbishop of Rouen When Louis XII (q.v.), King of France, ascended the throne in 1498 Amboise was appointed cardinal and premier. As premier he became the most important figure in the political affairs of the country. He introduced reforms in the judicial system, reduced taxation, and from 1499 to 1503 was active in military campaigns in northern Italy against Milan. After the death of Pope Alexander VI (*see under* ALEXANDER) in 1503, Amboise made unsuccessful efforts to gain the papacy. He served as papal legate to France from 1503 until his death.

AMBRIDGE, borough of Pennsylvania, in Beaver Co., on the Ohio R., about 16 miles N.W. of Pittsburgh. Ambridge manufactures metal products, structural steel, building supplies, and electrical equipment. Economy, a commune, was established on the site in 1825 by the Harmony Society. Pop. (1970) 11,324.

AMBROSE, Saint (340?–397), one of the most celebrated of the Fathers of the Church (q.v.) and one of the four doctors of the Western Christian Church, born in Trier (now in West Germany), and educated in Rome, Italy His father was prefect of Gaul. Ambrose studied law, entered the civil service, and in about 370 was appointed a consular magistrate in Upper Italy, with his headquarters at Milan In this office his kindness and wisdom won for him the esteem and love of the people, who called for him to be bishop of Milan in 374. Although he refused to accept this position and even left the city to avoid it, he finally turned to Milan and allowed himself to be baptized. As bishop, Ambrose defended the churches of Milan against the introduction of Arian doctrines (*see* ARIUS) and brought Theodosius I (q.v.), Emperor of Rome, to repentance and public penance for ordering the massacre of the rebellious Thessalonians (q.v.). Ambrose is best known as the sympathizing friend of Monica (332?–87), mother of Saint Augustine (q.v.), and as the one who received Augustine into the Church. He is the patron saint of Milan, and the Ambrosian Library (q.v.) in that city was named in his honor. Among his writings are a number of exegetical treatises and a manual of Christian morality. He also composed many hymns, several of which are extant. His feast day is Dec. 7.

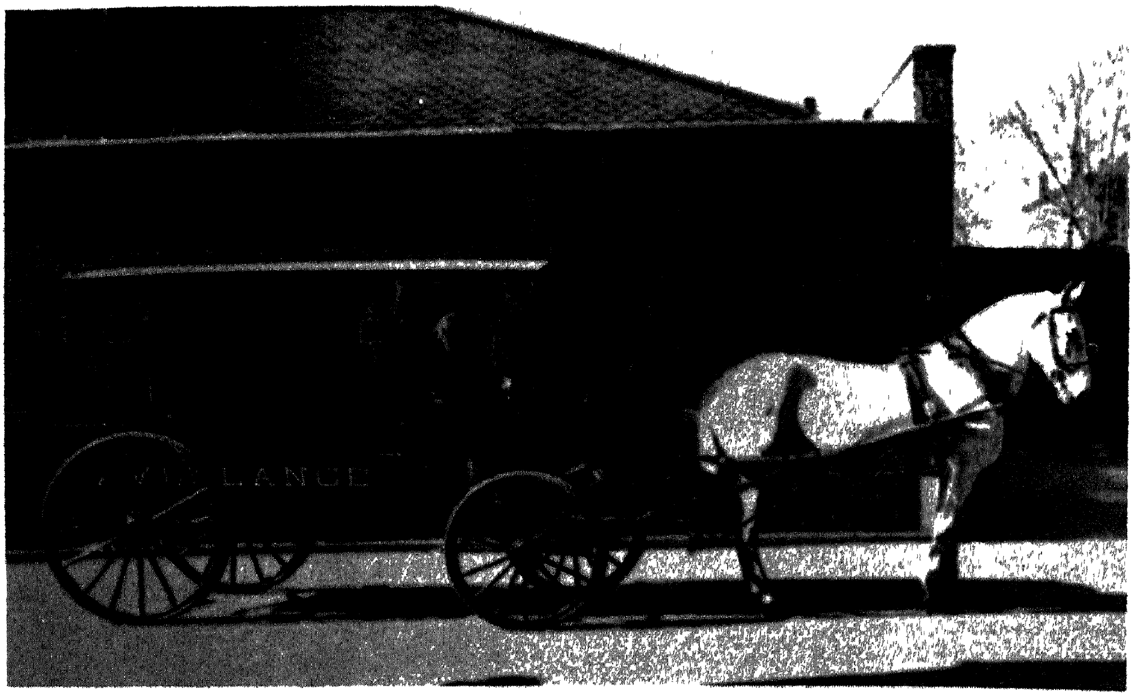
AMBROSIA, in classical mythology, food eaten by Greek and Roman gods, thought to impart immortality. Sometimes ambrosia was mixed with nectar (q.v.) and taken as a drink. The deities also used ambrosia as an ointment or perfume. When the gods allowed ambrosia to be given to a mortal, the taster acquired special divine qualities Today, the term is commonly used to mean any fragrant or delicious-tasting substance. *See* GREEK RELIGION AND MYTHOLOGY; ROMAN RELIGION AND MYTHOLOGY.

AMBROSIAN LIBRARY, famous library in Milan, Italy, named after Saint Ambrose (q v), patron saint of the city The library was founded in 1609 by Count Federigo Borromeo (1564–1631), Archbishop of Milan It contains over 500,000 printed volumes, 35,000 manuscripts, and 2100 incunabula Among the manuscripts are a Greek Pentateuch (q v) dating from the 5th century A D ; several palimpsest texts of classic authors, fragments of the translation of the Bible into the Gothic language by Ulfilas (q.v.), Bishop of the Goths; a manuscript known as the Codex Atlanticus, containing notes and drawings by the Italian artist and scientist Leonardo da Vinci (q.v.); and a volume containing the writings of the ancient Roman poet Vergil, with marginal notations by the Italian poet Petrarch (qq.v.).

AMBULANCE, vehicle designed for the transportation of the sick or injured. In addition to cots mounted on a resilient base to prevent jarring the patients, modern ambulances are equipped with blood-transfusion apparatus, oxygen-inhalation devices, and in some cases incubators for the newborn The primary purpose of the ambulance is to carry patients to a medical center for treatment, but ambulances are also used to move the convalescent from the hospital to the home. The two main types of ambulance are the civilian and the military Modern civilian ambulances are built for speed and smooth riding. As a rule they have facilities for one or two patients and an attending physician or nurse. Community hospitals, most voluntary and private hospitals and clinics, and, in the larger urban areas, many private firms provide ambulance service.

Because of the rugged conditions in the field, military ambulances are designed for sturdiness rather than for speed and are equipped for emergency treatment of the wounded on the way to the collecting stations. The military ambulance usually has a load capacity of six ambulatory or four stretcher patients.

Animal-drawn ambulances first were used in the 1850's in the Crimean War. Standardized horse-drawn military ambulances were introduced in the United States during the Civil War. The first U.S motorized ambulance unit operated in Mexico in 1916 during the American punitive expedition against the Mexican revolutionary general Pancho Villa (*see* VILLA,



An ambulance used in New York City in 1899.
Museum of the City of New York

FRANCISCO). Since the signing of the Geneva Convention (q.v.) in 1864, ambulance units and the wounded in their care have been considered neutrals on the field of battle. D.B.A.

AMEBA. *See* AMOEBA.

AMEN (Heb., "certainly" or "truly"), expression used in worship by Jews and Christians and, to a lesser extent, by Muslims. When it is uttered at the close of a prayer it signifies "So be it" and expresses affirmation or belief. When it is said after repeating the Creed (*see* CREEDS), it means "So it is."

AMEN, ancient Egyptian deity. *See* AMON.

AMENDMENT. 1. In legislation, the alteration of an existing statute. Although the United States Congress has no power to alter the Constitution, it does have the power to repeal and alter laws. The method of amending the Constitution is provided by Article V. According to this article, an amendment passes after a two-thirds vote of both houses of Congress or after the petition of two thirds of the State legislatures. Amendments are ratified by either the legislatures of three fourths of the States or by conventions in three fourths of the States. The Constitution of the U.S. contains no provision directly limiting the power of the State legislatures to repeal the statutes of the several States, but Article I, Section 10, limits the power of a State legislature to repeal statutes that are in effect contracts with the citizens of the State.

2. In parliamentary procedure, a motion, bill, or resolution. When adopted in accordance with the rules of parliamentary procedure, an amendment becomes a part of the original motion or bill.

3. In the law of pleading and practice, the correcting of an error or defect in a pleading or judicial proceeding in the progress of an action (q.v.) or other proceeding.

AMENDMENTS, CONSTITUTIONAL. *See* CONSTITUTION OF THE UNITED STATES: *Amendments to the Constitution*

AMENEMHET *or* **AMENEMHAT,** name of four Egyptian kings, the most important of whom were the following.

Amenemhet I, first king of the XII Dynasty, who reigned from about 2000 B.C. for thirty years, ten of them in a coregency with his son, Sesostris I (1980–35 B.C.) He limited the power of the nobles, reorganized the government, and restored prosperity to Egypt

Amenemhet III, who reigned from 1849 to 1801 B.C. He forced the submission of the provincial vassal governors to the throne, and constructed extensive irrigation and reclamation projects. His trading fleets sailed the Red Sea, and the Mediterranean Sea as far as Syria and the islands of Cyprus and Crete. *See* EGYPT: *History: The Middle Kingdom.*

AMENHOTEP *or* **AMENOPHIS** (Egypt., "Amon is satisfied"), name of four Egyptian kings of the XVIII Dynasty, the most important of whom were the following

Amenhotep III, builder of extensive architectural works, including a portion of the temple of Luxor. He reigned for thirty-six years, from about 1410 B.C., developing and strengthening the Egyptian empire

Amenhotep IV. *See* EGYPT, ARAB REPUBLIC OF: *History. The New Kingdom;* IKHNATON.

AMERICA, American patriotic hymn, sometimes known as "My Country, 'Tis of Thee", the words of the first line. The text was written in 1832 by the American clergyman and poet Samuel Francis Smith (q.v.), and it was set to an air often attributed to the British musician Henry Carey (q.v.). The original song, "God Save the King", is the national anthem of Great Britain.

AMERICA, second-largest isolated land mass of the earth, comprising the two continents of the Western Hemisphere. America is a common designation for either or both North America and South America, for the Western Hemisphere as a whole, and for The United States of America. The entire Western Hemisphere is often called the Americas. The word first appeared in *Cosmographiae Introductio* ("Introduction to Cosmography"), edited and published in 1507 by the German cartographer Martin Waldseemüller (q.v.). The name was derived from Americus, the Latinized given name of the Italian navigator Amerigo Vespucci (q.v.), whose expeditions to the New World are described in the work. As used by Waldseemüller, America specifically designated the lands discovered by the Italian explorer Christopher Columbus (q.v.), Vespucci, and other early explorers of the West Indies and the N.E. coast of the southern continent. The Flemish geographer Gerhardus Mercator (q.v.) first used the word to refer to all of the Western Hemisphere on a map of the world published in 1538. *See* EXPLORATION, GEOGRAPHIC; NORTH AMERICA; SOUTH AMERICA.

AMERICAN, river in N. central California, about 30 mi. long. The source is in the Sierra Nevada Mts., and it flows in a generally S.W. direction between El Dorado and Placer counties, emptying into the Sacramento R. near Sacramento.

AMERICAN ACADEMY OF ARTS AND LETTERS, honorary association founded in 1904 by the National Institute of Arts and Letters (q.v.) to serve the interests of literature and the fine arts. Only members of the parent organization are eligible for election to the academy. Membership, limited to fifty, is granted for literary, musical, and artistic achievement. The academy awards annual prizes to members and nonmembers for distinguished work in painting, sculpture, the novel, poetry, and drama

AMERICAN ACADEMY OF ARTS AND SCIENCES, institution that sponsors projects designed to relate the intellectual resources of the learned professions to problems of science and of social and technical change. It was founded in 1780 in Boston, Mass., where its headquarters are now located Included in its membership are more than 2000 fellows and more than 300 foreign honorary members, elected for eminence in scholarship and professional attainments The academy publishes a quarterly journal, *Daedalus,* an annual, *Records;* and a number of books, articles, and papers. The academy also awards prizes for achievements in arts and sciences

AMERICAN ACADEMY OF DRAMATIC ARTS, training school for acting founded by Franklin Haven Sargent (1856–1923) in New York City in 1884, and chartered by the regents of the University of the State of New York in 1899 The curriculum of the academy consists of two six-month terms during which instruction is given in voice, speech, history of the theater, American mime, dance, singing, makeup, costume, fencing, radio and television techniques, and acting styles in modern and classical drama During the second term, students invited by the academy are organized into a repertory company which presents twenty-five to thirty productions before a public audience. Enrollment in 1975 was about 1000 students, and the faculty numbered about forty-five members In 1974 the American Academy of Dramatic Arts West was opened in Pasadena, Calif.

AMERICAN ANTI-SLAVERY SOCIETY, association organized in December, 1833, in Philadelphia, Pa., for the purpose of advancing the abolition of slavery in the United States It was established by delegates from similar State and local societies, including the Boston, Mass., organization, founded in January, 1832, under the leadership of the abolitionist William Lloyd Garrison (q.v.), and the first such society in America. The three abolitionist leaders responsible for the establishment of the American Anti-Slavery Society were Theodore Dwight Weld (1803–95), Arthur Tappan (1786–1865), and Lewis Tappan (1788–1873). Militant in the fight against slavery, the organizers of the society were regarded in the southern States as fanatics, members of the society were denounced, and meetings were broken up. In 1839, some less militant members broke away from the society and formed the Liberty Party (q.v.). The society operated until 1870, when the adoption of the Fif-

San Xavier del Bac, 18th-century Spanish mission near Tucson, Ariz. Its bell towers, balustrades, and carved facade show baroque style successfully transported to the New World.

Gene Ahrens-Bruce Coleman, Inc

teenth Amendment to the Constitution granted citizenship to Negroes. *See* ABOLITIONISTS; CONSTITUTION OF THE UNITED STATES; SLAVERY.

AMERICAN ARBITRATION ASSOCIATION, private nonprofit organization founded in 1926 to administer arbitration in voluntary agreement with the disputants. The association has about 25,000 qualified arbitrators who resolve labor, commercial, and contractual disputes, and the claims of uninsured motorists. When requested by the parties in dispute, the association presents a list of arbitrators to be selected by the disputants. Membership in the association is open to labor unions, trade associations, civic groups, law firms, and private parties. *See* ARBITRATION; LABOR RELATIONS: *Modern Practices.*

AMERICAN ARCHITECTURE, the art and technique of building as developed in the British colonies in North America and subsequently in the United States. American architecture represents a strongly individualistic and original achievement, although European immigrants to the U.S. brought with them varying styles of architecture. European design of the late Middle Ages through modern times has continued to influence American building. In most cases, the imported modes were adapted to the new environments and to new technological and social developments. Historically, American architecture may be divided into three main periods. The first, the colonial period, lasted from the founding of English settlements early in the 17th century to the American Revolution, which ended in 1783. The second, which may be called the era of expansion, lasted from the establishment of the American republic to World War I, which began in 1914. The third, the modern period, takes in the years from World War I to the present.

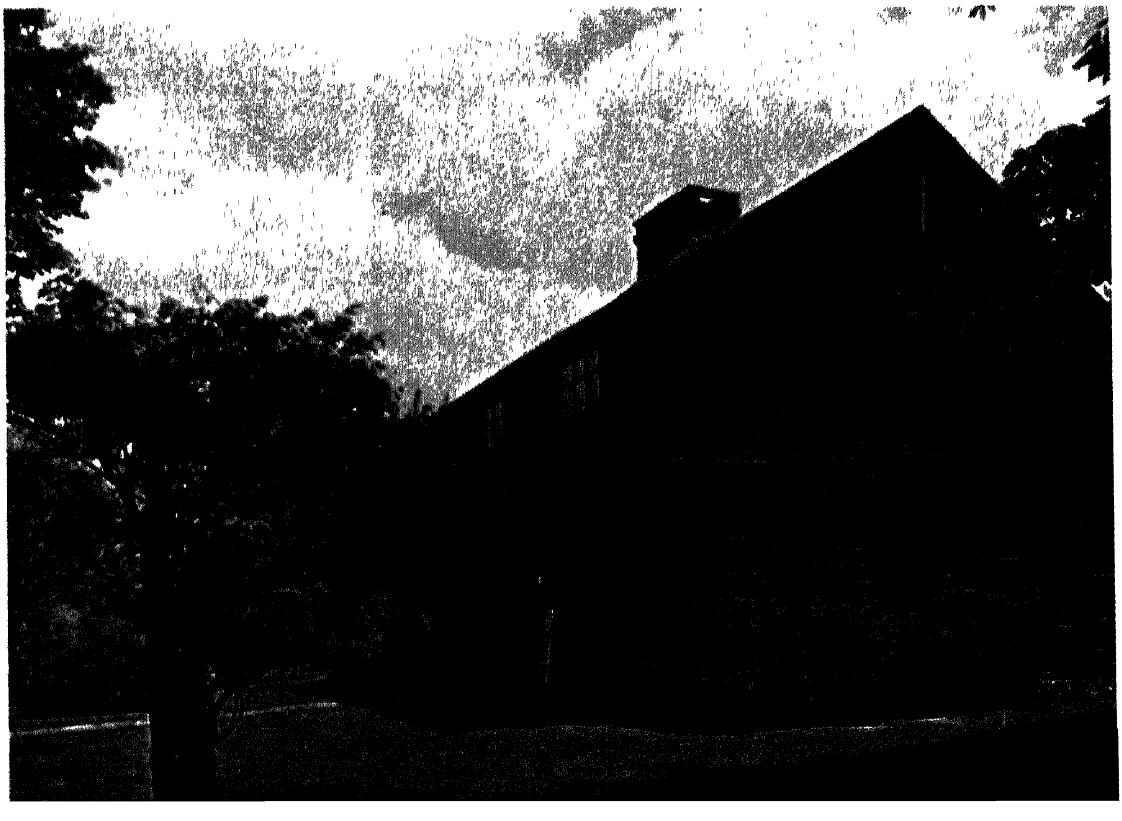
THE COLONIAL PERIOD

When the first permanent settlers arrived in America, they found only the primitive architecture of the American Indians, to which they were unaccustomed. They began to build in styles that reflected their origins. Thus, the English colonists built in the English manner; far to the southwest, in Florida, and along the Gulf Coast, Spanish settlers built in a Spanish form of the baroque style (*see* BAROQUE); along the Mississippi R., French settlers built in the French manner, and, later, in New Orleans, in a French-Spanish manner. In the same way, in New Netherland, which later became New York, Dutch settlers built in the Dutch manner; and in New Sweden, later Delaware, Swedish settlers, coming from a forested country, introduced the Swedish log cabin, which became typical of the American woodland frontier. All of these national styles, which deviated somewhat from their original forms, entered into the American architectural heritage. This varied heritage prepared the way for the eclecticism, the borrowing of forms from different cultures and periods, that characterized the era of expansion of the U.S. to the Pacific, at a time when eclecticism also became prevalent in Europe.

English Colonial Styles. The first colonial homes in the British colonies were of wattle, clay, and thatch, like the peasant huts of England Later the homes, like many rural Tudor houses, were built of hewn planks set up on end in plaster, in so-called half-timber construction. The more prosperous settlers began to build in the styles that were fashionable in England, particularly a special version of the Italian Renaissance based upon the architecture of the Italian artist Andrea Palladio (q v) Some time elapsed before the hard conditions of pioneer life permitted similar standards of comfort and elegance in America, and early colonial building was rather plain. Yet stone mansions were built, for example, the Whitfield House, built about the middle of the 17th century, in Guilford, Conn Brick dwellings were also built, such as the Adam Thoroughgood House (about 1640), near Norfolk, Va. These two surviving representatives of the larger American houses of the mid-17th century have big, picturesque chimney stacks rising up the gable ends. An example of a more modest, although relatively ample, type of dwelling is the Barnard-Capen House (1636) in Dorchester, Mass. No 17th-century house has survived to the present without alteration or restoration, but the best restorations are probably close to the originals. Practically no example remains, however, of the most common type of building of that period, that is, the one-room dwelling with a single fireplace and a loft for sleeping, which was used by people with limited means. Such houses were low, dark, and crowded Vestiges of them are incorporated in larger buildings erected over or around them, such as the Hempsted House (1678, enlarged in 1728) in New London, Conn

No examples of meeting houses of the period have survived Records indicate that they were small, simple, barnlike structures which rarely included decorative features or fine furnishings The Old Ship Church (1681) in Hingham, Mass., retains part of the original building The recently restored Saint Luke's church in Smithfield, Va , is largely of the late 17th century Constructed of brick, with a tower, stepped gable, and the older English style of Gothic tracery, it resembles a very small church of the same period in England. In its mixture of the older Gothic and the new modified classical elements, it also reflects the changing styles, as they occurred some decades earlier, in English building.

When means were available, the architects of the period employed decorative features, such as ornamental plasterwork, blue and white tiles,



Stanley-Whitman House (about 1660), Farmington, Conn Overhanging story recalls medieval English houses Central chimney (and its two fireplaces), clapboards, and small windows are for warmth

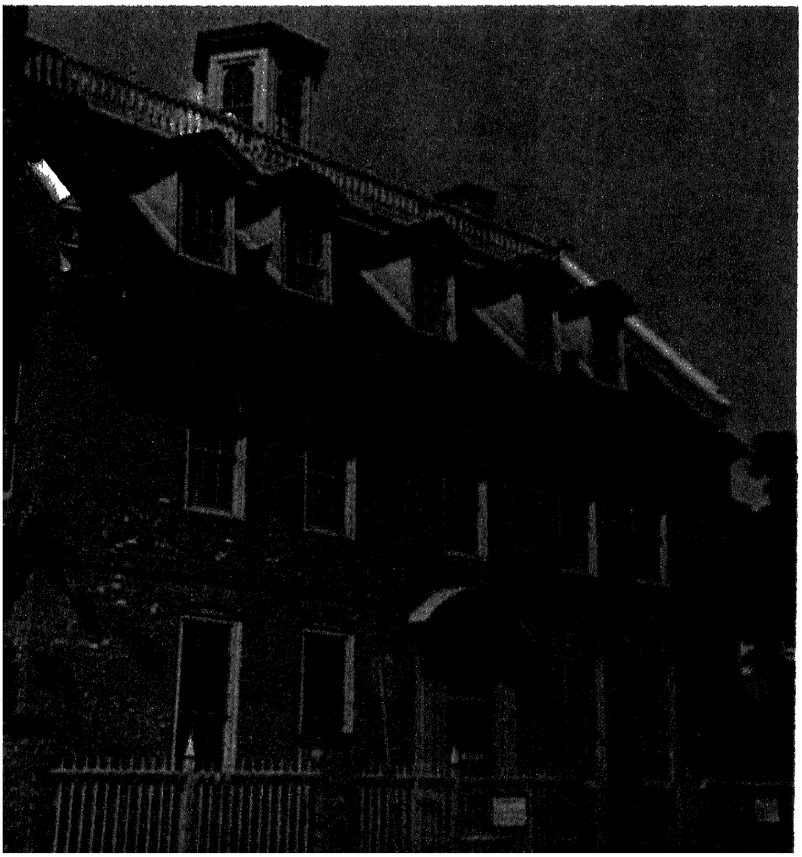
Conn Department of Commerce

carved moldings, and painted decorations on floors, walls, and possibly on ceilings. Such decoration suited the tastes of the prosperous northern merchants and southern planters, who possessed splendid silver, upholstered furniture, and sumptuous clothing.

In many regions the modes of the 17th century persisted into the 18th These modes overlapped with the developing English Georgian styles imported by the more prosperous settlers. Great Georgian mansions were erected by the wealthy merchants of Boston, Mass., New York City, and Williamsburg, Va., and by southern plantation owners, particularly the tobacco planters. Built of brick or stone, these edifices had spacious central hallways, handsome staircases, and lofty ceilings. The rooms were more numerous, better heated, and better lighted than those of earlier buildings. Such mansions reflected the elegance of the Georgian styles evolved in England under the influence of such architects as Sir Christopher Wren (q.v.) and James Gibbs (1682–1754). Books illustrating the plans and ornamental details of the new building types circulated among the wealthier and more cultured stone masons and carpenters Inspired by such works, which reflected the influence of the baroque style then sweeping Europe, colonial master builders composed sumptuous overmantels, doorways, staircases, and plasterwork Homes and churches took on a more sophisticated air.

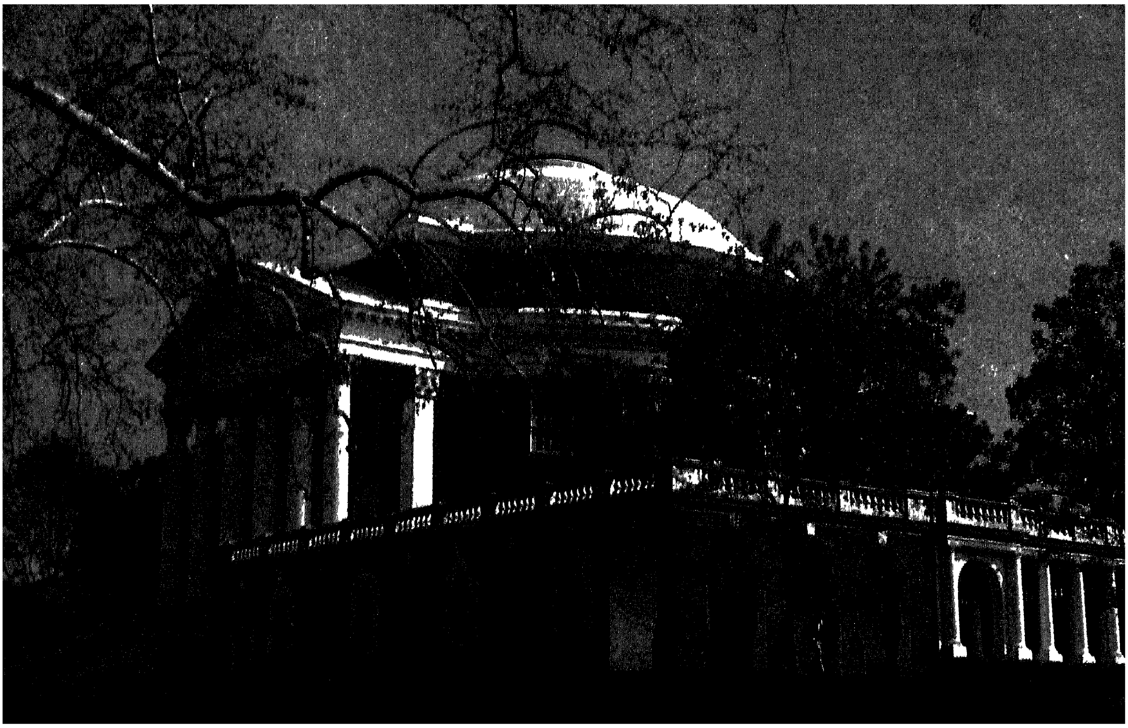
More attention was given during this period to gardens and the orderly layout of the grounds, shown in the enrichment and successive enlargements of Mount Vernon (q.v.), built in 1743, the estate of President George Washington (q.v.) in Fairfax County, Va In this way a closer resemblance was achieved between the simple wooden American houses and the enormously larger, porticoed, stone-built British mansions, with their formal landscaping.

Churches such as those designed by the American architect Peter Harrison (1716–75) in Newport, R.I., and Boston, Mass., and by other architects in New York City and Philadelphia, Pa., became more monumental. The porticoes expanded, the spires rose higher, and the interiors grew more spacious and carried more lavish decoration Public buildings, as well, reflected the Georgian styles This trend was seen at colleges such as Harvard, William and Mary, and Yale, in State houses such as those in Boston and Williamsburg, in markets such as that in Newport, and in places of assembly such as Faneuil Hall in Boston and Independence Hall (qq.v.) in Philadelphia Although constructed on a scale and in materials harmoniously related to



MacPhaedris Warner House (about 1716), Portsmouth, N.H. The dignified brick box with symmetrical facade and classical pediments is a New England adaptation of English Georgian style

Editorial Photocolor Archives



Rotunda, University of Virginia A masterpiece of the federal style, it was designed by Thomas Jefferson as a modified replica of the Pantheon (Rome); it opened in 1826
University of Virginia Information Services

the size of the cities and the size and style of adjoining structures, these buildings did not approach the majesty of comparable structures being erected in Europe.

Non-English Contributions. Meanwhile, the Spanish, who had been settling South America and Central America, had extended their missions northward into what is now the Southwest. Their most durable monuments were churches such as the 18th-century baroque church of San José in San Antonio, Texas, and similar edifices built later in California. In the French settlements along the Mississippi R., there developed a regional type of verandaed house with steeply sloping roofs. Of these, only a few remain, among them the building at Sainte Geneviève, Mo. In New Orleans, La., the French and Spanish styles were fused into a characteristic new style marked by wrought-iron balconies. In New York and New Jersey, the Dutch settlers had introduced their masonry houses with stepped gables and little porches. All of these varied national styles contributed to the development of American architecture.

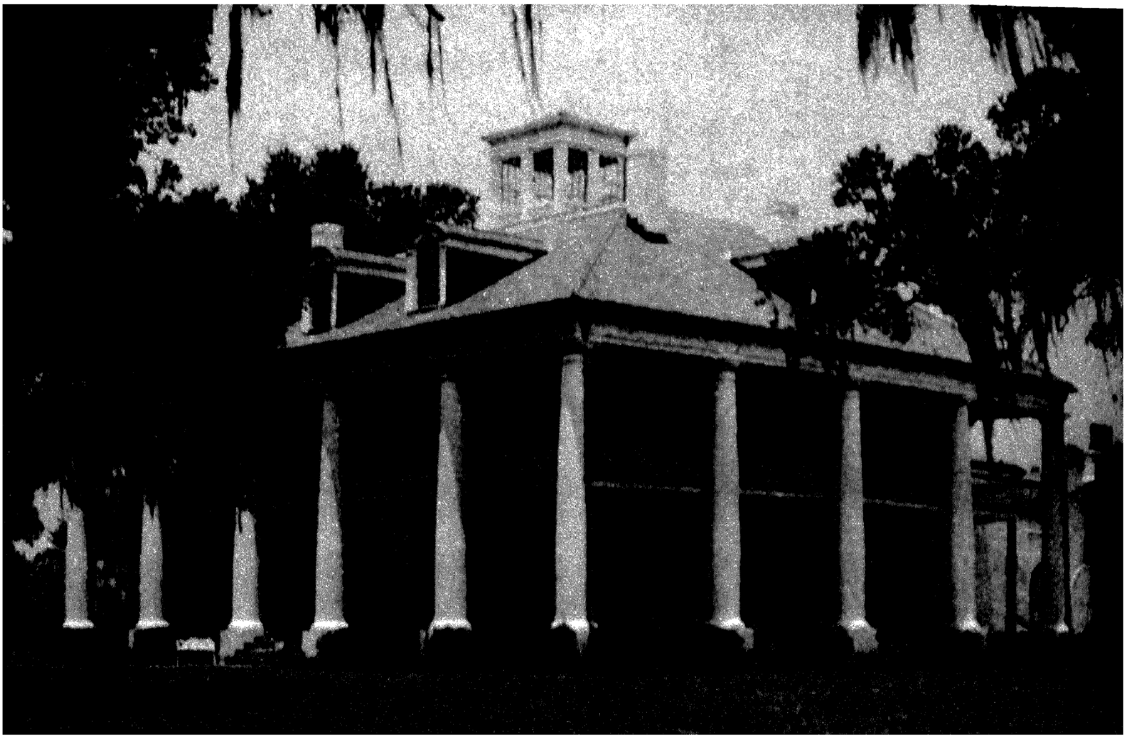
ERA OF EXPANSION

After the American Revolution, and particularly after the acquisition of the Louisiana Territory, the nation began its expansion westward. The architecture of the newly formed country shared the sense of exuberant growth. New European stylistic trends, which began to set in about 1750, profoundly influenced American architecture for the next two hundred years. This period is usually referred to as the classical revival

Among the many causes of this artistic revolution was the emergence of a new class, which quickly amassed great fortunes through new industries and acceleration of world commerce. Symbolic and associative values were found in the monuments of the past, especially those of classical Rome, because the early American statesmen felt an affinity for the Roman republican institutions.

The new styles, however, did not remain fixed on Roman public buildings. Reflecting American interest in all the cultures of the world, the new styles also drew upon the delicate ornament at Pompeii, the austere temples at Paestum and Athens, the exotic shapes of mosques and pagodas in the East, the pyramids and obelisks of Egypt, and the medieval cathedrals In 1785, the American statesman Thomas Jefferson (q v.) recommended an ancient Roman building, the Maison Carrée in Nîmes, France, to his compatriots as the model for the new State Capitol to be built in Richmond, Va. George Washington concurred with him in urging that the masterpieces of the past be used as models for new buildings in the U.S

Architects trained in Europe came to the U.S., including Peter Harrison; William Thornton (1759-1828); Pierre Charles L'Enfant, who laid out the plan for Washington, D.C.; Benjamin



Houmas House (1840), near Burnside, La. A plantation house in colonnaded Greek revival style, its deep porches on two levels provide shady outdoor living space. Akhtar Hussein–Woodfin Camp & Associates

Henry Latrobe; and Richard Upjohn (qq.v.). The American federal style, as it is called, began as a version of classicism with emphasis on simplicity of form and delicacy of ornament. Gradually, however, it became more and more robust and grand. Colonnades, temple fronts, and domes arose as in Europe, to demonstrate national wealth and stability. For the new national capital, Washington, D.C., L'Enfant, in 1791, laid out a great city according to French baroque principles. The builders erected Georgian houses and a Renaissance classic Presidential palace, the White House (q.v.), begun in 1792. These were followed by a Greek Treasury Building and an Egyptian obelisk, the Washington Monument (q.v.).

Eclecticism. Similar eclectic practices prevailed in the other cities of the new nation. In the 19th century, Gothic churches and mansions in the form of Greek temples framed city squares and village greens. Once the architectural horizon had been broadened to this extent, other Romantic fashions were to follow through the succeeding century. However, a minor classical current, emphasizing symmetry and traditional restraint, persisted. Along with this Greek revival, which lasted until the Civil War, there began about the turn of the century a Gothic revival; the latter became a dominant trend at mid-century (see *The Romantic Revivals*, below).

A number of other major styles marked the long period of eclecticism. Precise dates cannot be given, because the styles overlapped and usually several were in vogue concurrently. The dates given below are therefore approximate. These major styles included the round-arch styles, Victorian Gothic, Second Empire, Romantic revivals, Richardson Romanesque, and the medley of styles that characterized the age of splendor, which ended with World War I.

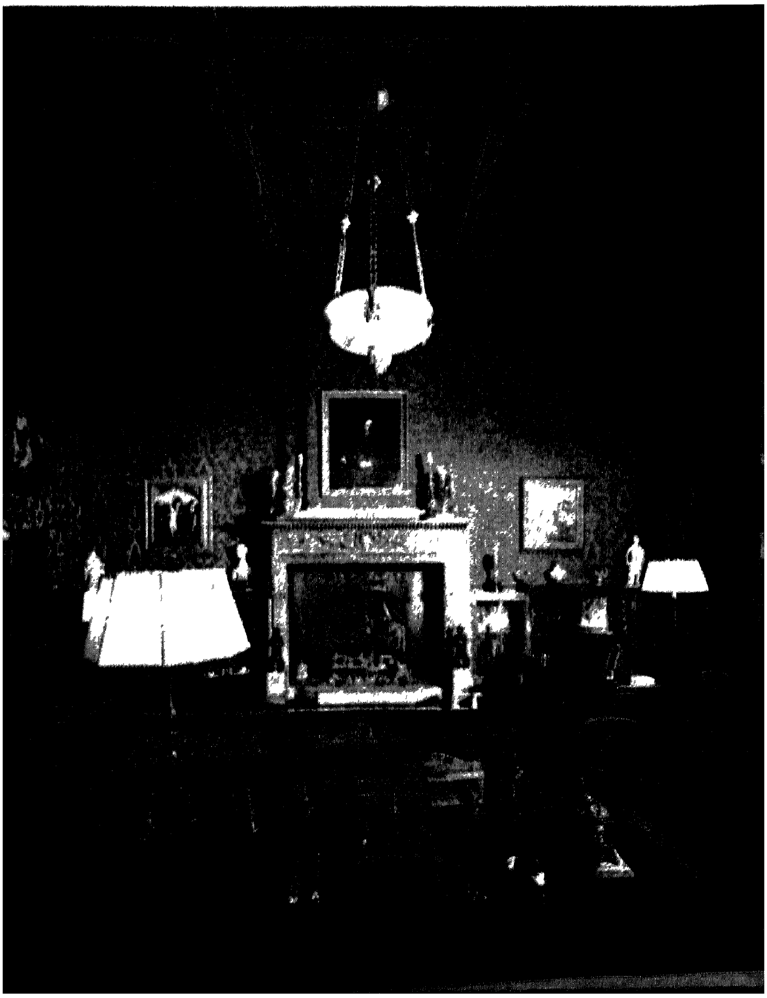
The Round-Arch Styles (1840–70). By the middle of the 19th century several round-arch styles, variously named Italian Villa, Railroad, Norman, and Lombard, were in common use. The round-arch styles were developed as economical, middle-class parallels to the Greek, Roman, and Gothic revivals. Unlike the latter, the round-arch styles required neither great architectural knowledge nor skilled craftsmanship. Their sources were the simpler architectural forms of the Romanesque period. These modes did not impose a rigid form, like the colonnade of a Greek temple, into which new and complex functions had to be somehow forced. Houses, churches, schools, and factories alike shared the casual, picturesque charm of these vernacular styles, which were applied occasionally to some major buildings, for example, the Smithsonian Institution (q.v.).

Victorian Gothic (1850–80). The High Victorian Gothic, along with the Second Empire style (see below), was used for major buildings Both styles reflected the prosperity and optimism of the mid-19th century Society was frankly materialistic, the U S possessed great wealth and was not hesitant about displaying it in costly buildings The period was an era of grand opera and sentimental poetry Such outspoken emotionalism seems excessive to modern eyes, but it expressed an enviable assurance

John Ruskin (q v) was the ideological father of High Victorian Gothic style This style permitted a mixture of details and motifs from every period of the past. The results were highly original Brilliant colors were favored, for example, in striped tile roofs, striking forms, such as thin towers and pointed arches, and rich detail, such as the carving that appeared on churches, museums, and even factories The American masterpieces of that period include Memorial Hall (1878) of Harvard University in Cambridge, Mass., by William R. Ware (1794-1843) and Henry Van Brunt (1832-1903), and the Connecticut State Capitol (1880) in Hartford. Many buildings, however, were designed in a much purer, even archeological Gothic style, such as St. Patrick's Cathedral in New York City (1858-79), by James Renwick (1818-95)

Second Empire Style (1860-90) The Second Empire style, derived from the France of Emperor Napoleon III (q v), was used in the U S chiefly for city halls (Boston, 1862, and Philadelphia, 1880) and post offices. The masterpiece of this style was the State, War and Navy Building (1871-88), by Alfred B Muller (1834-70), now called the Executive Office Building, it is located west of the White House in Washington, D C Although classical in detail, the columns, pavilions, mansarded roofs, and towers of this style were piled up in a picturesque and intricate diversity. Towers were applied to every type of building, from hotels to hospitals In the 1870's and 1880's the trend led to the building of town and country houses in the style of French châteaux (see *The Age of Splendor,* below) The most important architecture of the mid-century was done, however, in one or another of the Romantic revivals.

The Romantic Revivals (1840-1900) The popularity of Gothic revival buildings persisted well into the 20th century. From Latrobe's



Study, Pierpont Morgan Library (1906), New York City. Designed by McKim, Mead & White in the Italian style, the mansion was one of many attempts to recreate European elegance for U S. millionaires.

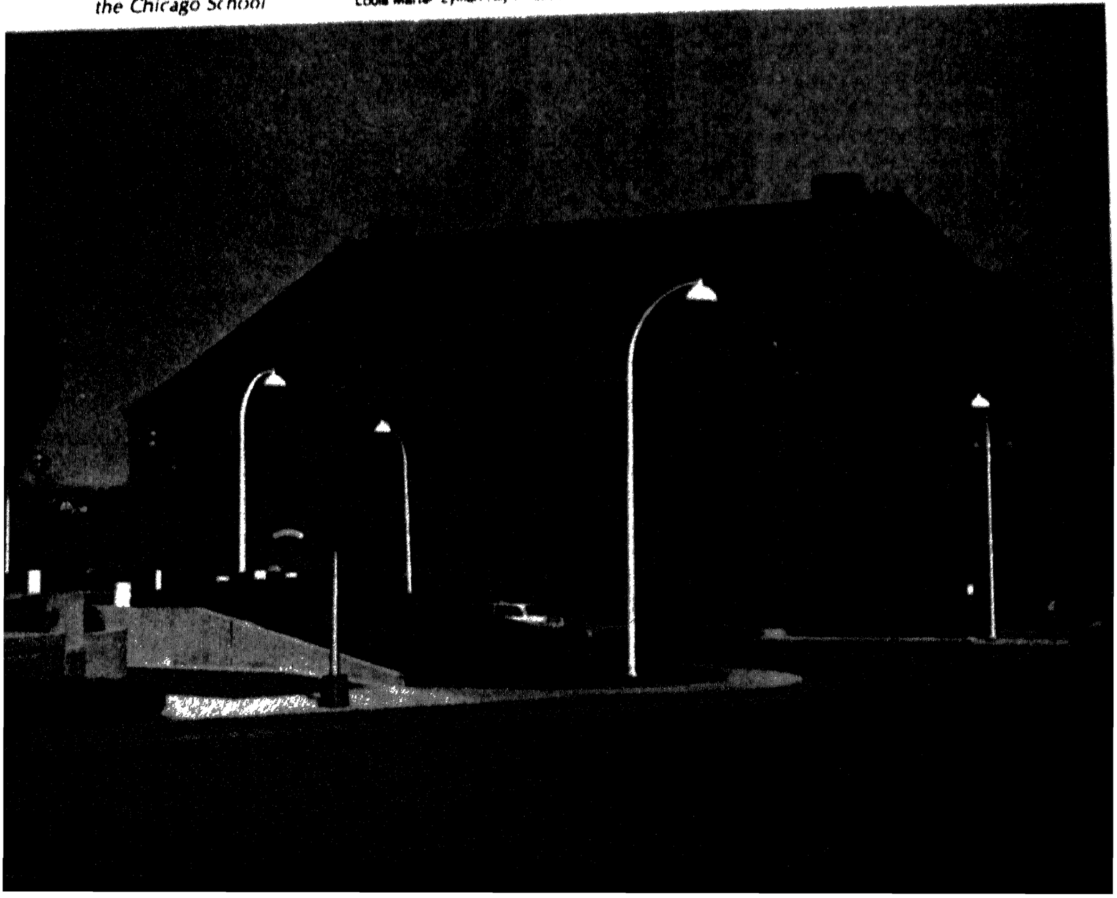
Alexandre Georges

Brackett Cottage (about 1840), Saratoga Springs N.Y. The steep gable, pointed windows, and fancy carving of carpenter's Gothic in wood recall grander Gothic structures in stone Saratoga Springs Preservation Foundation Inc

Gothic mansion (1800) near Philadelphia to the Gothic facades of modern university libraries, such as that at Princeton (1913) the Romantic style ruled almost everywhere Gothic churches were being built as late as the 1950's The Romanticism of the period explored many kinds of medieval architecture besides the Gothic, particularly the early and late Romanesque In addition to the previously cited round arched and Victorian Gothic styles was the more individualized Richardson Romanesque style of the American Henry Hobson Richardson (q v)

Richardson Romanesque (1870-1900) Richardson returned in 1865 to the U S from Paris, where he received his training He brought with him a fondness for the ancient Romanesque buildings of France For a few years he dabbled with other fashionable styles but then settled down to a massive stone style of his own creating His first masterpiece was Trinity Church (1877) in Boston Mass his last, the Allegheny County buildings (1884 87) in Pittsburgh, Pa For twenty years Richardson his partners, and his numerous followers constructed beautiful Romanesque fortresses These irregular, picturesque asymmetrically towered buildings can still be seen in almost every American city

The Age of Splendor (1880 1914) In the 1880's the unceasing quest for new architectural



Railway Station (1886), New London Conn Designed by H. H Richardson, its quiet massiveness and horizontality recall Romanesque style and point forward to the Chicago School Louis Martel Lyman Allyn Museum styles added the following to the eclecticism in American building a revival of American colonial architecture, particularly its Georgian phase, a revival in the South and West of Spanish colonial, a return to baroque grandeur in the temporary buildings of the expositions in Chicago, Ill (1893), Buffalo, N Y (1901), and Saint Louis, Mo (1904) The gleaming white palaces erected at these expositions were heavily dependent on the architectural fashions of Paris as sponsored at the École des Beaux-Arts, where many of the greatest American architects had studied The Beaux-Arts influence was seen in the classical, domed State capitols rising in nearly every State, in libraries and museums, in railroad terminals such as Grand Central Station (1913) and Pennsylvania Station (1910, demolished in 1968) in New York City, and the Union (1907) in Washington, D C

The architects of these enormous monuments included such famous firms as Carrère and Hastings, D H Burnham and Company, and McKim, Mead and White (*see* WHITE, STANFORD). Impressive town houses and resort châteaux were also included in their work, such as the Vanderbilt mansion "Biltmore" in Asheville, N C. (1890), by Richard Morris Hunt (*see under* HUNT) The designs were grand and lavish, but often derivative In their eclecticism, these architects sometimes imported from Europe whole buildings or parts of buildings to be incorporated in new structures Often, however, the buildings showed original creativity The hold of these architects was so strong that it withstood, for many years, the genius of such innovators as the American architect Frank Lloyd Wright (q.v.), the demands of expanding American industry, and the swift growth of the American population Despite the advances of American technology, the old eclectic architecture persisted after modernism had been in the ascendant in Europe for some years.

MODERN AMERICAN ARCHITECTURE

The architecture of the U.S. in the 20th century grew from several 19th-century roots. One was the advance in building technology, so strikingly displayed in the American skyscraper. Another was the development of expressive new idioms of form and space in the works of the American architects Louis Henry Sullivan (q.v.) and Frank Lloyd Wright.

Technology and the Tall Buildings (1830's-1950's). The 19th century was one of the most technically inventive centuries in history. It saw the application of new techniques and of new mechanical means in virtually every activity of man. The 19th century produced also a new technology of building, which inevitably affected architecture In time it became clear that the new, great contributions in architecture would come from those who grasped the possibilities of the new materials and the new techniques

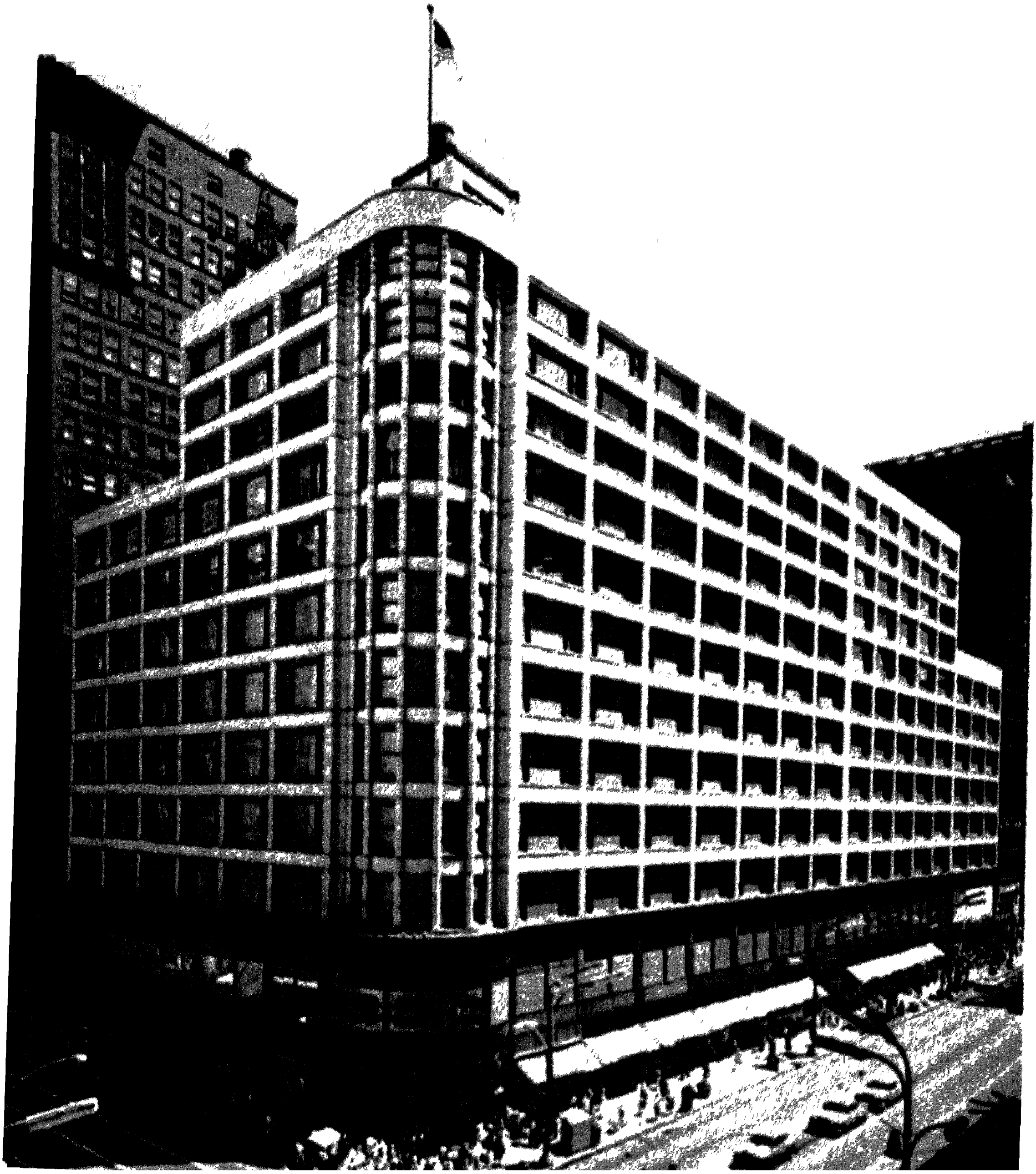
In addition to the stimulus of the new resources provided by technology was the spur of necessity With the population doubling in almost every generation, with production growing at an even faster pace, builders could scarcely keep up with the demands upon them In the frenzy of new building, tradition was abandoned when it stood in the way When conventional craftsmanship proved too slow, new techniques were devised Even in the 1830's, revolutionary methods of building with wood were developed to meet the demands for speedy construction and to overcome the shortage of skilled labor

Men such as the American inventor James Bogardus (1800-74) responded to the demand by developing cast iron into a building material lighter and more adaptable than masonry Cast iron could be fabricated into cheap, standardized parts that could be rapidly bolted together, and buildings could be prefabricated and shipped to distant places Other innovators developed metal trusses that made it possible to roof column-free interior spaces easily and cheaply Such roofs were used for railroad stations, market halls, exhibition palaces, and domes like that of the Capitol of the U S (q v) in Washington, D.C

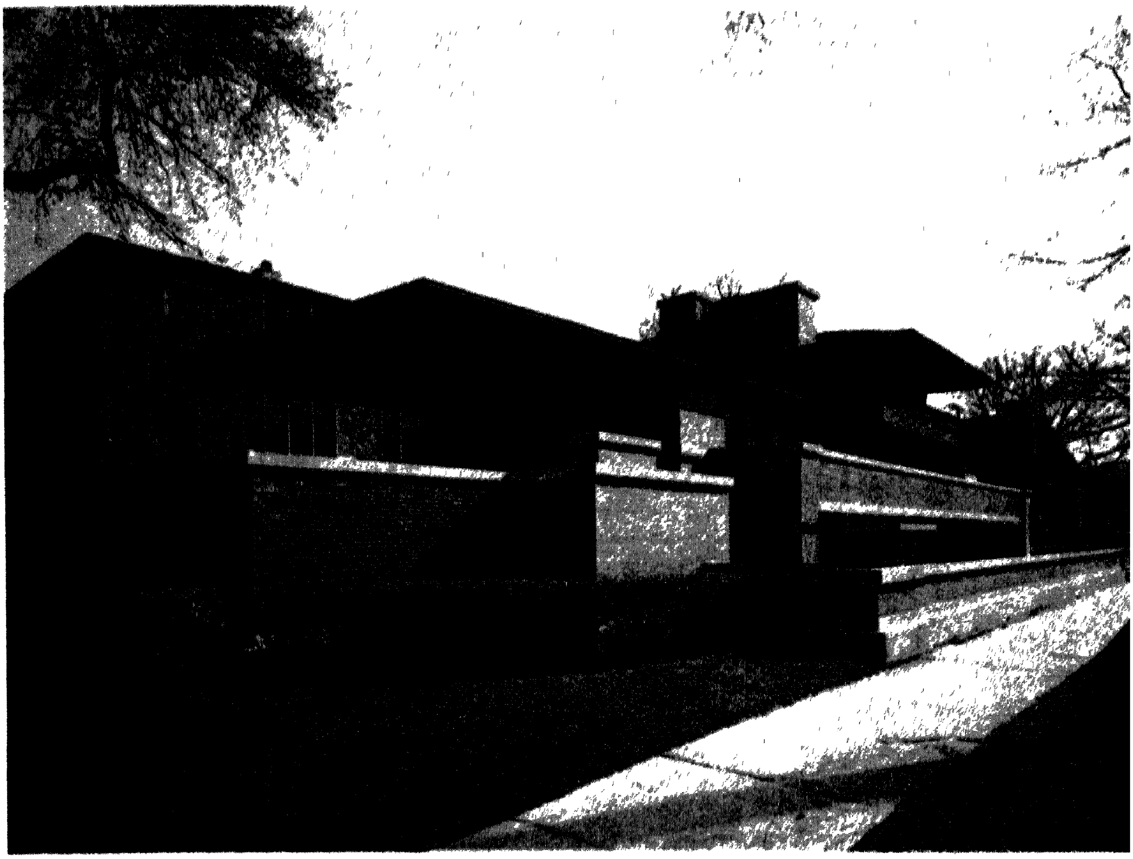
After the American Civil War, metal frames were combined with other inventions, notably the elevator, making possible tall buildings, unprecedented not only for height but for ease of construction The decisive example was the Home Insurance Building, by William LeBaron Jenney (q v.), erected (1883-87) in Chicago The metal frame supported the entire building, dispensing with the ponderous masonry of former times. The race for height ended for the time being, in 1930, with the construction of the Empire State Building in New York City. This building, measured without the 222-ft television antenna added later, was 1250 ft high, taller than the 1000-ft. Eiffel Tower (q.v.) in Paris, which was the highest structure of the 19th century In 1968 the John Hancock Center in Chicago rose to a height of 1107 ft., plus 344 ft. of television antennae. The World Trade Center in New York City, with construction still going on, rises higher than the Empire State Building; see *Recent Trends and Achievements,* below. In 1974, however, the tower headquarters of Sears, Roebuck, and Company, under construction for some years in Chicago, Ill , reached 1454 ft , superseding the World Trade Center's 1350 ft (without television antennae)

Some forerunners of this type of architecture were Louis Henry Sullivan, who designed the Wainwright Building (1890), in St Louis Cass Gilbert (q v) architect of the Woolworth Building (1913), in New York City, and the team headed by Wallace Kirkman Harrison (1895-) that designed the United Nations headquarters in New York City (1947)

Louis Sullivan and the Art Nouveau (1880's 1910) Sullivan creator of many superb buildings was among the greatest American architects His designs were marked by a distinctive lavish curvilinear ornament, but



Carson, Pirie, Scott Building (1904) Chicago, Ill Louis Sullivan's spacious, clean-lined structure with its horizontal bands of windows was the forerunner of modern department store architecture Hedrich Blessing



Robie House (1909), Chicago, Ill Frank Lloyd Wright's influential design used low, sweeping lines, squat chimneys, sheltering overhangs, and warm-hued bricks to express a Midwest prairie setting Hedrich-Blessing

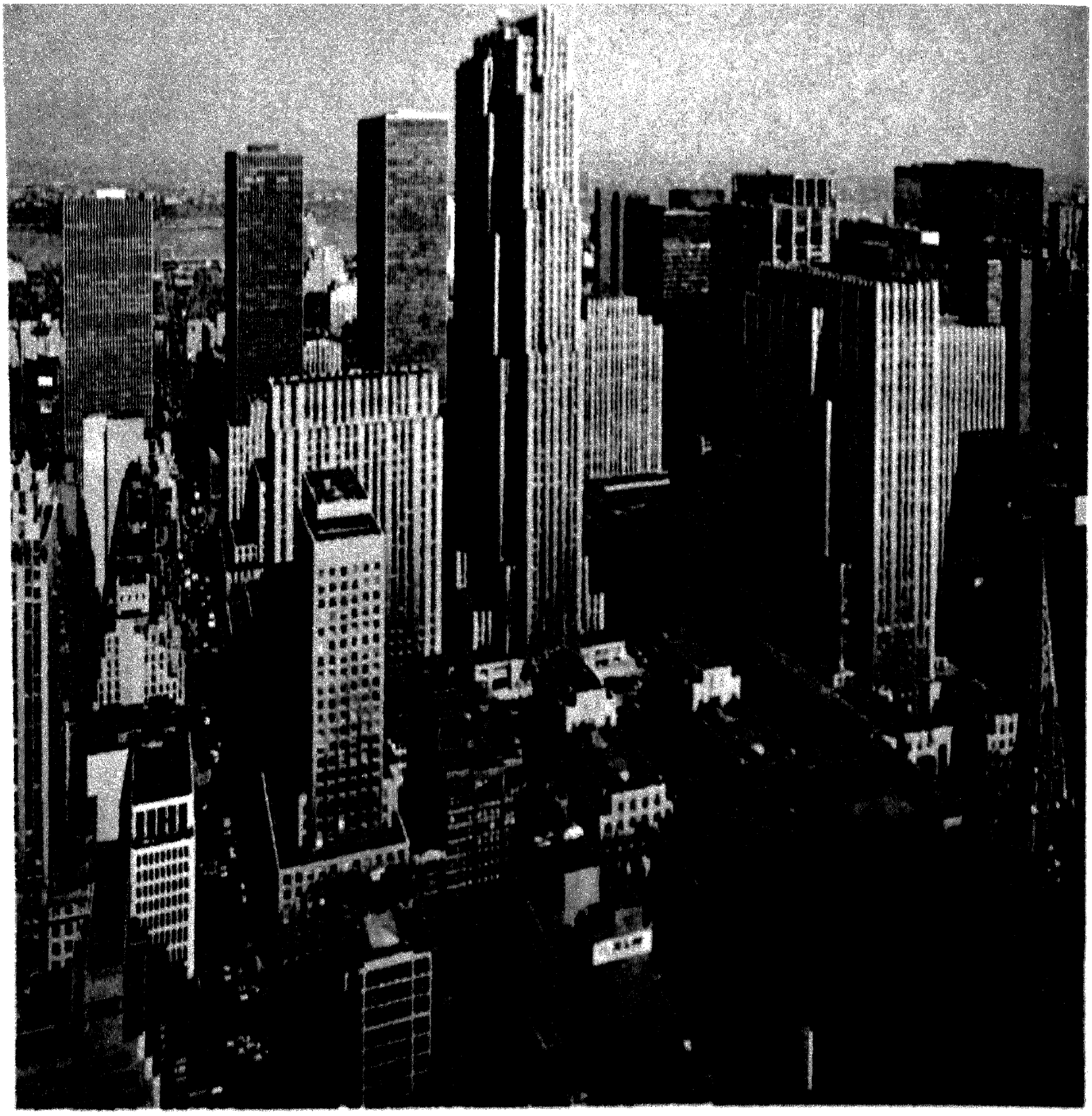
were also derived organically from the materials and function of the building His buildings were not only great works as architecture, but previsions of the architecture of the future. Among them were his Auditorium Hotel (1889), now Roosevelt University, and the Carson Pirie Scott Department Store (1904), both in Chicago. Sullivan's exquisite ornament, although his own creation, was analogous to the so called art nouveau style that was beginning to sweep Europe

Among Sullivan's other contributions are his books *Kindergarten Chats* (in serial form, 1901-02) and *The Autobiography of an Idea* (1924), both of which greatly influenced the new generation of architects by postulating the theory that form follows function.

Frank Lloyd Wright and the Prairie Style (1890's-1950's). In Chicago, during the latter part of the 19th century, a school of architects, of whom Sullivan and Wright (Sullivan's foremost pupil) were the most famous, originated a new American style of domestic architecture. Their house designs were long, low, spreading, informal, and organic, exemplified by Wright's Robie House (1909) in Chicago. This prairie style became internationally known and was regarded as truly American, fresh, and modern

For more than a decade Wright was virtually ignored in his own country His ideas were taken up abroad, however, principally in Europe The so-called international style which developed there and which absorbed his concepts began to influence American architecture in the 1920's. Later examples of Wright's creativity are his dramatic use of the landscape in the house called Falling Water (1936-37), which is cantilevered over a waterfall, the Johnson Wax administration building (1936-39), for which he also designed (1950) a research tower, and the Guggenheim Museum (1946-59)

The international style was especially influenced also by the German Bauhaus school (*see* BAUHAUS), founded by Walter Adolf Gropius (q v.), and by the abstract artists interested in the pure form of the Dutch de Stijl school, among whom was the painter Pieter Cornelis Mondriaan (q v) Some architects of the Bauhaus school, notably Ludwig Mies van der Rohe (q v), were also identified with de Stijl.



Rockefeller Center (1930's), New York City. The slablike stone skyscrapers (center) grouped around a pedestrian mall show effective city planning. Glass towers behind (1960's) adapt the international style. Ezra Stoller-ESTO

The International Style. The earliest clear example of the international style was the Schröder house erected in Utrecht, the Netherlands, in 1924 by the architect Gerrit Thomas Rietveld (1888–1964). In this structure can be seen the three elements of the new style: a new vernacular of forms borrowed largely from abstract art, consisting of planes, lines, and rectangles without ornament or moldings; the interpenetration of exterior and interior space, rather than rooms as separate boxes; and a new structural system, the use of reinforced concrete; see CONCRETE: *Reinforced Concrete or Ferroconcrete.*

Although American architects of genius, particularly Wright, had done much to prepare the way for the new style, the U.S. was relatively slow to adopt it. The international style did not come into general favor in the U.S. until the 1940's. Yet Americans produced some of the early monuments of the new style, among them the Philadelphia Savings Fund Society Building (1931) in Philadelphia, by the American architect George Howe (1886–1954) and the Swiss-born architect William Lescaze (1896–1969), and the Lovell House (1929) in Los Angeles, Calif., by the American architect Richard J. Neutra (q.v.).

The new style, with its angular forms, plane surfaces, and lack of conventional ornament, met with some resistance from the public, which tended to regard it as bare and inhuman But by mid-century, the style had become dominant across the country Presently, as in the Georgian period, it is possible to find communities, such as the town of Columbus, Ind , in which all buildings, from factory and shopping center to homes and schools, form a harmony of modern architecture

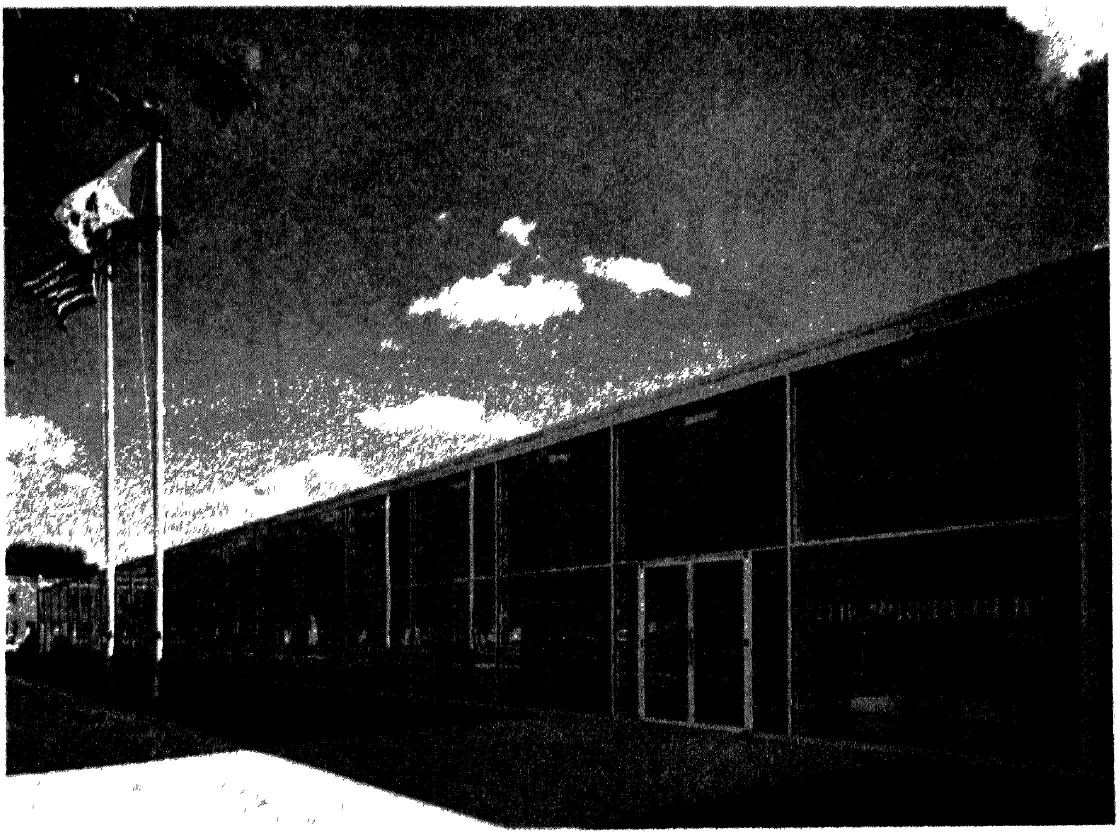
The new buildings make bold use of modern construction methods and structural materials Noteworthy among the latter are glass treated against glare, glass brick that admits additional light while preventing glare and that furnishes effective insulation against heat, cold, and noise, artificial stone; plywood and other adaptations of wood and wood derivatives, gypsum, plastics, chromium, aluminum, copper, and other metals, and above all, processed steel and reinforced concrete By means of reinforced concrete, which is well suited to cantilever construction, forms freer and bolder than the richest Gothic have been achieved

Recent Trends and Achievements. At first, modern American architecture was wanting in truly monumental expression, but a certain climax had become apparent in American architecture by the mid 1950's.

Rockefeller Center in New York City has become a landmark in modern American architectural history Designed by a team of architects headed by Wallace Kirkman Harrison, this complex of skyscrapers has exercised increasing influence in the years since 1931, when work on the center was started The significance of this complex, the first of its kind ever built, is that it represents architectural thinking on a multibuilding and community scale Because of that practical example, American architects are able to respond more and more creatively to such demands of contemporary American life as rapid intercommunication and integration of city and surrounding region An impressive result of multibuilding planning is the World Trade Center in New York City, still under construction Designed by the American architect Minoru Yamasaki (1912-) and the firm of Emory Roth and Sons, the center consists of two 110-story towers, 1350 ft high (completed in 1973), and four smaller buildings grouped around a plaza

Among other impressive examples of modern

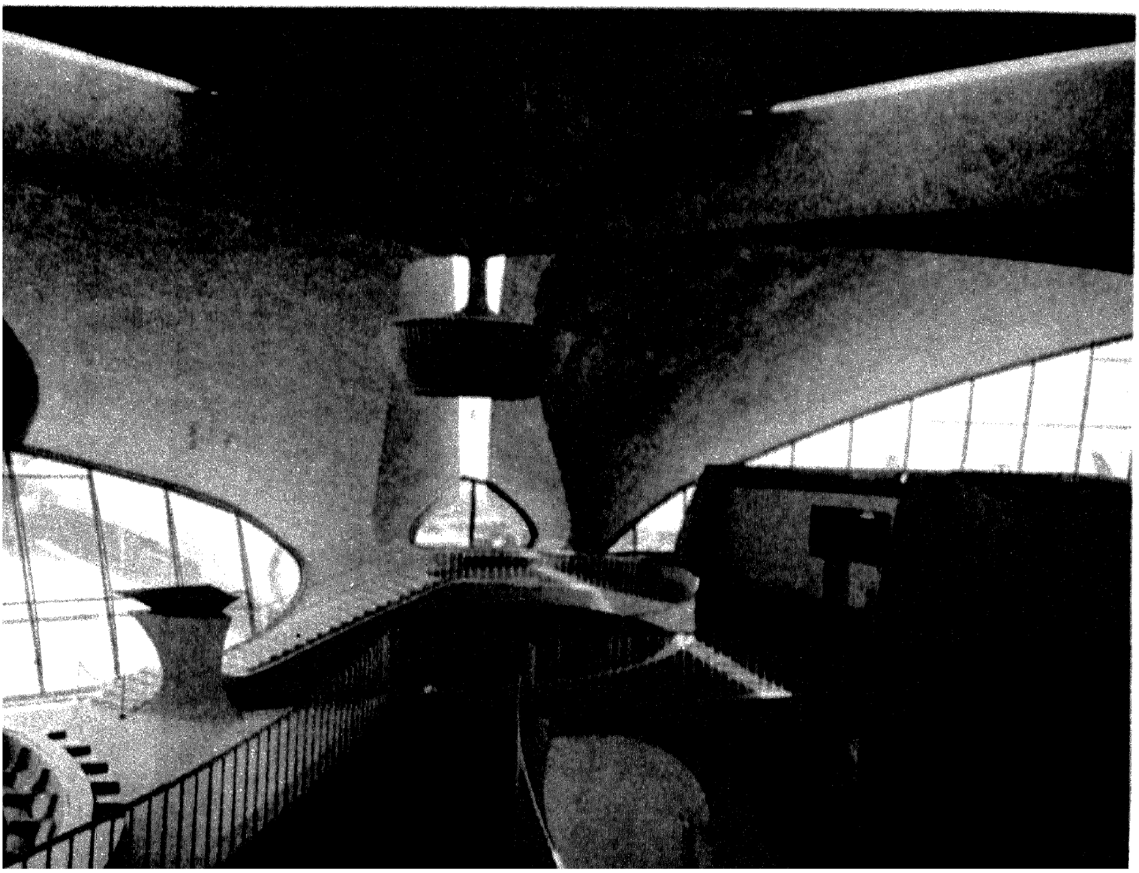
The Republic *newspaper plant (1971), Columbus, Ind This horizontal, glass and steel box by Skidmore, Owings & Merrill exemplifies the European-based international style vital since the 1920's* Ezra Stoller-ESTO



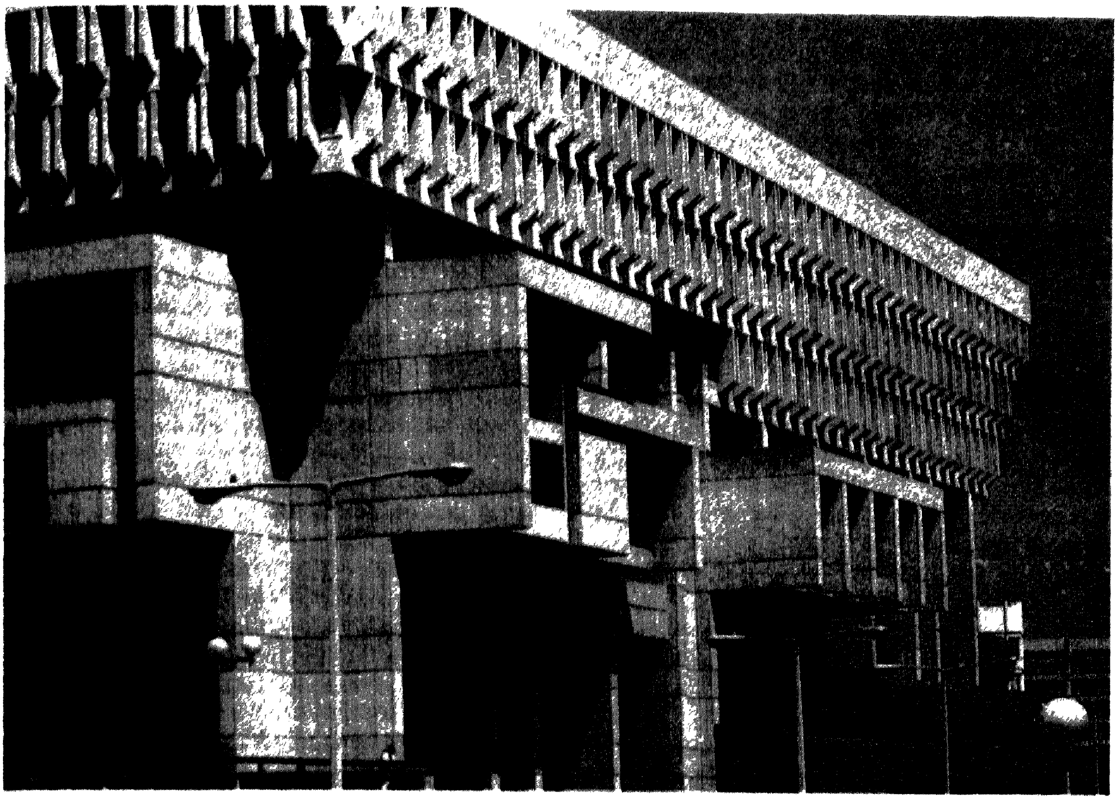
American architecture is the Seagram Building (1958), designed by Mies van der Rohe and the American architect Philip Cortelyou Johnson (q.v.). This edifice is notable for the integration of outer plaza and entrance lobbies and for the formal purity of design. The Hungarian-American architect Marcel Lajos Breuer (q.v.) received acclaim for the massive blocklike structure of the Whitney Museum (opened in 1966), in New York City. Another recent museum structure is the Gallery of Modern Art (opened in 1964) also in New York City, designed by Edward Durell Stone (q.v.), who is best known for his grillelike covered facades. A notable example of thin-shell, reinforced-concrete vault structure is the Trans World Airlines Flight Center (1962) at Kennedy International Airport in New York City, designed by the Finnish-born American architect Eero Saarinen (*see under* SAARINEN).

Some of the most innovative architecture has been applied to post-World War II designs of houses of worship. Materials, such as glass, concrete, and aluminum, have been used, and shapes have ranged from sharp geometric forms to swooping parabolic curves. Examples are the so-called fish church in Stamford, Conn., by the firm of Harrison and Abramovitz (1958), and Philip Johnson's mushroom-shaped shrine in New Harmony, Ind. (1960).

A new tendency toward greater freedom of design emerged in the 1960's and continued into the 1970's, moving away from the repetitive formulas that had resulted from total acceptance of the international style. New emphasis on the starkly expressive power of material and on uncompromising clarity of form is represented by what has been termed the New Brutalism. Examples include such monumental, varied, yet still humane buildings as the new Boston City Hall, by the firm of Kallmann, McKinnell and Knowles (1969); the innovative works of Louis I. Kahn (1901-74), among them the Richards Medical Research Laboratories of the University of Pennsylvania in Philadelphia (1961) and the Salk Institute for Biological Studies, San Diego, Calif. (1965); and the work of Paul Rudolph (1918-), particularly his Art and Architecture Building at Yale (1963).



Interior, TWA Terminal (1962), Kennedy Airport, New York City. Through the swooping sculptural quality of reinforced concrete shell construction, Eero Saarinen creates a sense of flight. Trans World Airlines, Inc.



City Hall (1969), Boston, Mass This monumental Brutalist structure by Kallmann, McKinnell and Knowles uses heavy, jutting forms of rough concrete cast on site It is part of a government center Bruce Coleman, Inc

American architecture, which began with the limited means and materials of a frontier economy and the strong colonial traditions linked with the motherland, developed dramatically in the 19th century through a variety of adopted and adapted styles, until in scope, originality, power, and sheer bulk it assumed the leading role in world architecture after 1945.

AMERICAN ART. *See* AMERICAN PAINTING; AMERICAN SCULPTURE.

AMERICAN ASSOCIATION FOR ADULT EDUCATION. *See* ADULT EDUCATION ASSOCIATION OF THE U.S.A.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, society of scientists, founded in 1848 for the purpose of advancing science in the New World in every feasible way. The association emphasizes the unity of interest of workers in all branches of science, which it promotes by such means as the publication of reports and the organization of meetings. The association has about 300 affiliated and associated societies, covering the entire field of pure and applied science. It is grouped in twenty-one sections: mathematics; physics; chemistry; astronomy; geology and geography; biological sciences, anthropology; psychology; social and economic sciences; history and philosophy of science; engineering; medical sciences; dentistry; pharmaceutical sciences, agriculture, industrial science, education; information, computing, and communication; statistics; atmospheric and hydrospheric sciences, and general science. The association publishes the weekly magazine *Science,* as well as various symposium volumes. It has produced new materials for the teaching of science from kindergarten through the elementary grades In the late 1970s membership, mostly in the United States and Canada, was about 130,000 Headquarters of the association is in Washington, D.C. Similar organizations have been established in other countries, as, for example, the British Association for the Advancement of Science and the Institute of France (q.v.).

AMERICAN BAR ASSOCIATION, national organization of the legal profession, founded in 1878. The activities of the association are handled through twenty-one sections and sixty-five standing and special committees. They include maintenance of high ethical standards for which a comprehensive Code of Professional Responsibility for lawyers was adopted in 1969; support of legal education and approval of law schools that meet the standards of the association; extension of legal services; and legal research through the American Bar Foundation. Policies of the association are determined by a 297-member house of delegates representing the legal profession and administered by a twenty-one-member board of governors. Membership in the association in 1969 was 141,000; an additional 19,000 members are in the law student division. Headquarters are in Chicago, Ill., and Washington, D.C.

AMERICAN BIBLE SOCIETY, society for the promotion of worldwide circulation of the Bible, without regard to the race or creed of the recipient. The society was founded in New York City in 1816. The Bibles distributed are the King James, the Revised Standard, and Today's English Version; they are dispensed at or below cost through the agencies of the society.

In 1968 the society distributed 77,950,978 Bibles or books of the Bible in more than 450 languages and in 150 countries. Scriptures for the blind in Braille, Moon, New York Point, and other systems have been distributed since 1835; *see* Blind, Aids for the: *Books and Writing*. Each year several thousand embossed volumes or talking-Bible records of the Scriptures, in more than fifty different languages, are distributed in the United States and abroad.

During World War I, the society sent more than 6,800,000 volumes to the armed forces of the belligerent nations. During World War II, over 14,500,000 copies of the Scriptures, in more than forty languages, were distributed over a six-year period ending in June, 1946. The American Bible Society has distributed about 893,342,900 Scripture volumes from its inception to 1968.

The official publication of the society is the *Bible Society Record*. Headquarters are in New York City.

AMERICAN CIVIL LIBERTIES UNION, national nonprofit, nonpartisan association founded in 1920 by a group of liberals, including the American social reformer Jane Addams, the American authors and editors Helen Keller and James Weldon Johnson, the American socialist leaders Eugene V. Debs and Norman Thomas, and the American jurist, Felix Frankfurter (qq.v.). By 1969, it had grown to embrace a membership of about 130,000; had 45 state affiliates and over 200 chapters throughout the United States; conducted its business through twenty staff attorneys and one thousand cooperating attorneys; and maintained a national staff in New York City, a legislative office in Washington, and a southern regional office in Atlanta, Ga.

Organized to defend the civil liberties of all citizens, it follows a liberal interpretation of United States constitutional law in defense of freedom of speech, press, assembly, and religion. It is active before national, state, and local legislative bodies, in courts of all jurisdictions, and in the preparation of educational materials. Since 1920 it has acted directly or by intervention in almost all cases involving civil liberty in the U.S. including the Sacco and Vanzetti, Scopes, and Scottsboro (qq.v.) trials, and cases involving freedom of expression in the arts, the rights of Jehovah's Witnesses (q.v.), the unconstitutionality of white primaries, and the prosecution of citizens under so-called loyalty acts. It also took a leading part in the legal fight that resulted in the abolition by the United States Supreme Court of segregation in public schools under the doctrine of equal but separate facilities. *See also* Civil Rights and Civil Liberties.

AMERICAN COLLEGE OF SURGEONS, guild organized in 1913 by some 500 surgeons of North America, representing every branch of surgery. The membership in 1968 was about 30,000 and included prominent surgeons of the United States, Canada, and about eighty foreign countries. The official journal is *Surgery, Gynecology and Obstetrics*.

AMERICAN COUNCIL ON ALCOHOL PROBLEMS, organization through which churches, individuals, and State-affiliated organizations cooperate in seeking solutions to the excessive use of alcohol, see Alcoholism, Intoxication, Alcoholic. The council, which adopted its present name in 1964, incorporates many temperance organizations, such as the Anti-Saloon League of America.

The Anti-Saloon League of America was established in 1895 by a coalition of temperance groups in four States and the District of Columbia, and was the outgrowth of a movement started in Oberlin, Ohio, in 1893. It embraced forty-nine States and territorial leagues and cooperated with the National Woman's Christian Temperance Union (q.v.), the World League against Alcoholism, and other temperance organizations. In 1929 it became affiliated with the National Association of Organizations Supporting the Eighteenth Amendment to the Constitution; see Constitution of the United States. The league was largely responsible for the adoption of that amendment, which prohibited the sale of beverages containing more than a specified percentage of alcohol, except for medicinal purposes. The name of the league was changed in 1948 to the Temperance League of America. In 1950 it merged with the National Temperance

Movement, Inc., to become the National Temperance League, Inc.

The official publication of the American Council on Alcohol Problems is *The American Issue*. Headquarters are located in Washington, D.C. *See* PROHIBITION.

AMERICAN COUNCIL ON EDUCATION, council of national and regional education associations and institutions of higher education, founded in 1918. The council is a center of cooperation for the improvement of education at all levels, with emphasis on higher education. It operates through its permanent staff, through five national commissions, and through special committees established for specific services. Financed by dues from member institutions and associations and by foundation grants, the council publishes handbooks, reports, and analyses of social and educational problems.

The council comprises about 200 national and regional associations and organizations, 1275 colleges and universities, and 50 affiliated institutions and organizations.

AMERICAN DRAMA. *See* DRAMA: *American Drama*.

AMERICAN ELK. *See* WAPITI.

AMERICAN EXPEDITIONARY FORCE, popularly known as the A.E.F., collective name for the military forces of the United States that served overseas, under the command of the American general John Joseph Pershing (q.v.), during World War I. The A.E.F. was the first American army composed almost entirely of draftees; *see* SELECTIVE SERVICE. For an account of the role played by the A.E.F. in the military events of the war, *see* WORLD WAR I.

AMERICAN FEDERATION OF LABOR, (A.F.L.), former federation of American international, national, and local trade unions. It was merged with the Congress of Industrial Organizations (q.v.) in December, 1955, to form the American Federation of Labor and Congress of Industrial Organizations (q.v.). The primary objectives of the A.F.L. included unionization of wage workers, support of legislation beneficial to labor, reduction of working hours, and improvement of working conditions and wages.

Although the A.F.L. included a few unions organized on a semi-industrial basis, such as the International Ladies' Garment Workers' Union, most were craft unions; *see* TRADE UNION, TRADE UNIONS IN THE UNITED STATES. The overwhelming majority of A.F.L. union locals throughout the United States and Canada, and a number in Mexico and Caribbean lands, were organized in national and international unions. The jurisdiction of each union was stated in the charter issued to it by the federation. Local unions outside the jurisdiction of the large affiliates, and small unions, called federal labor unions, whose memberships were not large enough to meet the charter requirements of the federation, were affiliated directly with the A.F.L.

The A.F.L. was a loosely organized federation that recognized the autonomy of the member craft unions. National and international policies were determined at the A.F.L. annual conventions and, between conventions, at the quarterly meetings of the Executive Council, which consisted of the president, secretary-treasurer, and fifteen vice-presidents; all these officers were elected at the annual convention. The national headquarters and all the activities were financed by per-capita dues paid by federation affiliates.

The A.F.L. was founded in Columbus, Ohio, on Dec. 7–8, 1886, during a period of widespread strikes for the eight-hour day. The Federation of

American Federation of Labor leaders of the 1920's: Frank Morrison (left), secretary; John L. Lewis, president of the United Mine Workers of America, an affiliate of the A.F.L.; and Samuel Gompers (right), one of the founders of the organization. UPI

Organized Trades and Labor Unions of the United States and Canada, established in 1881 to encourage labor legislation, and several unaffiliated trade unions merged to form the A.F.L. The American labor leader Samuel Gompers (q.v.), president of the Cigarmakers International Union and of the Federation of Organized Trades and Labor Unions, was elected president of the new federation. Under his leadership the federation adopted a policy of supporting political candidates considered friendly to labor regardless of party affiliation.

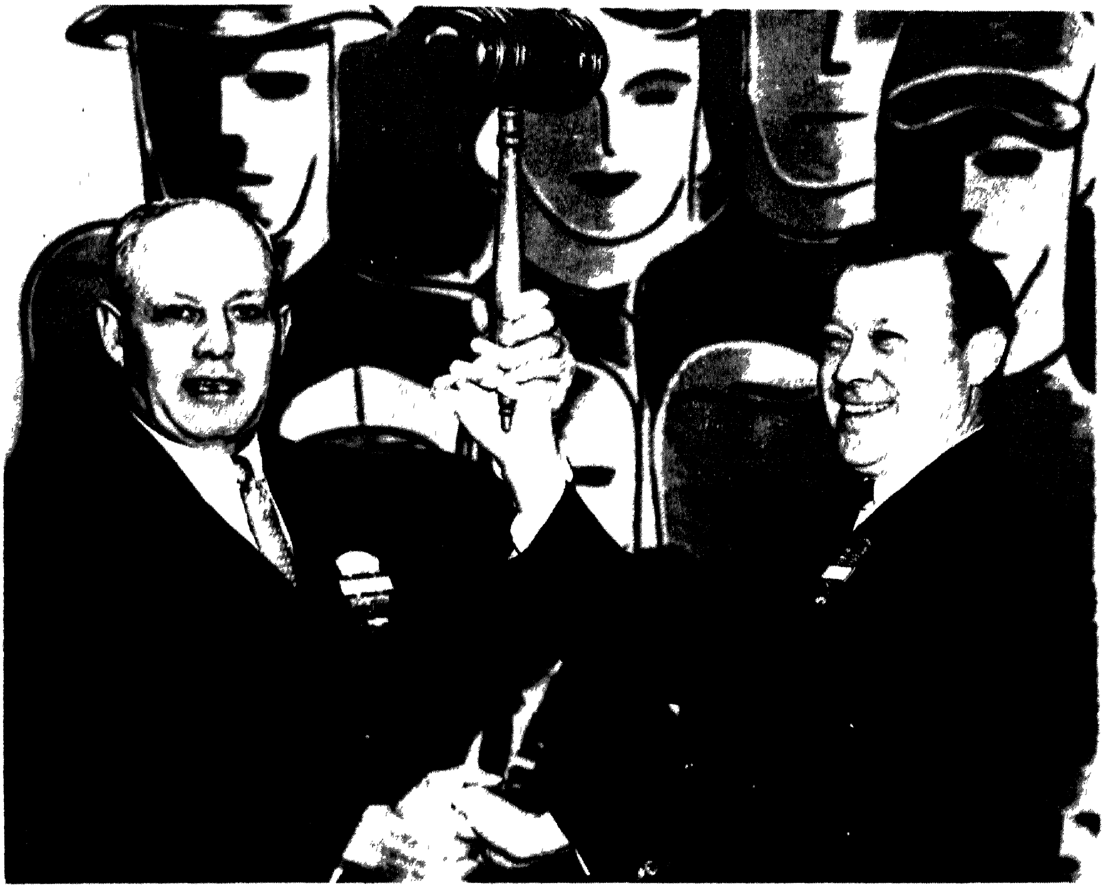
In 1924, when Gompers died, William Green (q.v.), a former miner, was elected president. Membership decreased in the 1920's, especially during the years of the depression between 1929 and 1933. The federation grew rapidly, however, during the strike wave of 1934 and as union organization was encouraged and protected by New Deal legislation. *See* United States: *The Roosevelt Administration.*

The traditional adherence of the federation to craft unionism, however, was an obstacle to successful, large-scale organization of unorganized workers, especially in such basic industries as steel, auto, rubber, petroleum, and shipping. In an effort to promote the organization of the workers in the mass-production industries, eight unions, in 1935, organized independently as the Congress of Industrial Organizations (C.I.O.). The loss of the unions in the C.I.O. was a serious setback to the A.F.L., but in the great strike wave of 1936–37 and with the expansion of industry and the growth of the national labor force during World War II, the federation gained several million new members; and the return of the International Ladies' Garment Workers and (temporarily) the United Mine Workers swelled its ranks. George Meany (q.v.), a former plumber, assumed the presidency on Green's death in 1952.

On Feb. 9, 1955, A.F.L. and C.I.O. committees, after intensive negotiations, concluded an agreement providing for the merger of the two organizations. A constitution for the projected combined federation was drawn up by a joint committee, and the organization became the American Federation of Labor and Congress of Industrial Organizations. Amalgamation was effected the week of Dec. 5, 1955, and Meany was elected president.

AMERICAN FEDERATION OF LABOR AND CONGRESS OF INDUSTRIAL ORGANIZATIONS, federation of autonomous trade unions, formed in December, 1955, by the merger of the American Federation of Labor and the Congress of Industrial Organizations; see Trade Unions in the United States. The merger, which healed a twenty-year breach in the American labor movement, took place at a joint convention of both organizations held in New York City. Among the purposes of the organization are the achievement of higher living standards, improved working conditions, and equal opportunities for all workers; the protection of the labor movement against corruption and racketeering; the elimination of jurisdictional disputes; and the organization of workers still not members of unions. The supreme governing power of the American Federation of Labor and Congress of Industrial Organizations (A.F.L.-C.I.O.) is vested in conventions held biennially. Between conventions, decisions are made by an executive council consisting of the president, the secretary-treasurer, and thirty-three vice-presidents, all elected by the convention. George Meany (q.v.) was elected the first president and William F. Schnitzler the first secretary-treasurer of the A.F.L.-C.I.O. They had held the same positions in the A.F.L. Walter P. Reuther (q.v.), formerly president of the C.I.O., was elected head of one of the important divisions of the organization, the Industrial Union Department; he also served as a vice-president of the A.F.L.-C.I.O. until his resignation in 1967.

The A.F.L.-C.I.O. includes 115 national and international unions, each of which is fully autonomous. Each carries on collective bargaining with employers, elects its officers, sets its dues, and provides the services its members need and want. In 1972 the A.F.L.-C.I.O. had about 13,600,000 members in the United States. Among its larger affiliates formerly belonging to the A.F.L. are the International Association of Machinists and Aerospace Workers with 754,000 members and the United Brotherhood of Carpenters and Joiners of America with 700,000; among the affiliated unions formerly in the C.I.O. is the United Steelworkers of America with 1,140,000. The International Union of United Automobile, Aerospace and Agricultural Implement Workers of America with some 1,500,000 members disaffiliated itself from the A.F.L.-C.I.O. in 1968. The International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America was the largest affiliated union until its expulsion in 1957, along with the Bakery and Confectionery Workers' International Union and the Laundry, Cleaning and Dye House Workers International Union, for failure to comply with the A.F.L.-C.I.O. constitution and the codes of ethical practices adopted by the A.F.L.-C.I.O. executive council. The two last-named unions were readmitted later.



George Meany (left), president of the American Federation of Labor, shares a gavel and joins hands with Walter P Reuther, president of the Congress of Industrial Organizations, at a joint convention in New York City in 1955 at which the two trade-union organizations merged UPI

AMERICAN FEDERATION OF MUSICIANS OF THE UNITED STATES AND CANADA, labor union of instrumental musicians, affiliated with the American Federation of Labor and Congress of Industrial Organizations (q v.) The jurisdiction of the Federation includes instrumental musicians in the following fields: phonograph recording; radio and motion pictures, including the broadcasting by live musicians and transcriptions; symphony orchestras, chamber-music ensembles; and hotel, café, and night-club orchestras.

The Federation was founded in 1896 and consists of some 700 locals, including those in Canada and Puerto Rico The individual locals are largely autonomous in the application of policies adopted at the annual conventions of the Federation. Local examination boards pass on the musical fitness of applicants for membership The Federation is administered by an executive board of nine (a president, two vice-presidents, one of whom is from Canada, a secretary-treasurer, and four other members from the United States and one from Canada) which is elected at the annual convention. The achievements of the Federation include a substantial increase in the level of salaries for musicians and the presentation of free public concerts by unemployed union members who are paid by the Federation out of royalties on recordings In 1967 membership in the Federation totaled about 280,000, membership in the U.S was 236,000 in 1972

AMERICAN FIELD SERVICE, known as A.F S, volunteer group founded in 1914 as an ambulance service to aid the French army during World War I After the War the volunteers established an international scholarship program. From 1918 to 1941, when the program was discontinued, grants were awarded to 220 American and French students for exchange graduate study in France or the United States. Reactivated in 1939, the A.F S ambulance corps served on many fronts during World War II The scholarship program was reestablished in 1947 to enable young people to visit and study abroad. Between 1947 and 1969, 31,406 students from seventy-nine foreign countries received grants and 15,793 students from the U.S. participated in a reciprocal program initiated in 1959. The A.F.S. program is operated mainly by volunteers.

AMERICAN FRIENDS SERVICE COMMITTEE, THE. See FRIENDS, SOCIETY OF.

AMERICAN INDIAN LANGUAGES, languages of the Indians of North America and South America. Although all American Indian languages differ greatly in grammatical type from those of the Indo-European group (see INDO-EUROPEAN LANGUAGES), it is impossible to single out the characteristics that distinguish one group from the other. All share, however, a tendency to group many units of meaning into multisyllabic words, each of which is usually as expressive as an entire sentence in English. For example, the single Cherokee word *nadeholi'nin* means in English "bring us the boat". In some Indian languages numerous elements, notably suffixes, prefixes, and various parts of speech, have been swallowed up and almost absorbed by long, many-syllabled words. The presence of one or another of these so-called captive units of meaning is usually indicated only by slight variations, or inflections, in the form of the parent word. The languages of the Penutian family are moderately inflective, approaching in this respect the Indo-European languages of Europe. In another group of Indian languages the key words are made up of independent syllables only loosely agglutinated, or "glued together"; these syllables may readily be transferred from word to word with little or no change in form. Ute is an example of a moderately agglutinative language, somewhat resembling Turkish in grammatical type. In a third group of languages, known as polysynthetic, each syllable is an independent, transferrable abbreviation of a much longer word. Eskimo and Algonquian are typical of the latter group. Most American Indian languages are classed as polysynthetic, but also exhibit agglutinative or inflective characteristics in varying degree. None of them, however, is an isolating language made up, as is English, of separate, distinct words that may be arranged and rearranged at will to express different thoughts.

In phonetics, also, the Indian tongues differ greatly among themselves and from Old World languages; each has its particular sounds, many of them strange to non-Indian ears. Some are mellifluous, some harsh; they are not especially guttural. In some Indian languages pitch is important; homonyms (words that sound alike) are differentiated by tones, such as high or low, as is the case in the Chinese language.

On the whole, the structure and form of American Indian languages follow rigid rules and are far more complex than those of modern European languages. For this reason Indian languages, though nonliterary, that is, lacking a body of written literature, are not primitive in the sense of being simple, uncomplicated, and easily mastered by strangers. The vocabularies are very large, but are deficient in specific words for many modern and Western concepts. Nonetheless, these languages are capable of expressing or explaining the most abstruse ideas. Nor has the lack of written language resulted in rapid change of form, as is usually believed.

Recent comparative studies have attempted to show connections between certain Indian languages and languages of Europe and Asia, for example between Eskimo-Aleutian and Ural-Altaic, Na-Dene and Sino-Tibetan, Nahua and Sanskrit and Indo-European, and Hokan and Malayo-Polynesian.

In pre-Columbian times no native American people had developed an alphabetic system of writing. The Maya had a hieroglyphic system consisting of conventionalized pictures, ideograms, and phonetic symbols, and certain other peoples recorded their folk history, myths, and traditions by means of pictographs. Perhaps the best known Indian pictograph system is that of the Kiowa tribe. See also ALPHABET; WRITING. In the centuries following the discovery of America missionaries and scholars reduced many Indian languages to written form, using the Roman alphabet. Nahua (Aztec), Maya, Quiché, Quechua, and Guarani became secondary "culture" languages (linguistic remnants of a culture that no longer dominated the region). The Spaniards created standardized orthographies for writing them, as did the Portuguese with Tupi in Brazil.

America is the region of greatest linguistic diversity in the world, with an unparalleled number of mutually unintelligible languages. Hundreds of distinct Indian tongues and over a thousand dialects are spoken. Many languages are spoken by only a few dozen or a few hundred persons. On the other hand some languages, such as Quechua, Nahua, and Maya, are each probably used by more than a million persons. Many obscure tongues, especially in South America, are known only through brief word lists collected by explorers or missionaries with no training in phonetics. In the great regions surrounding the Amazon R. new languages are still being discovered. Few good grammars of the different languages have been published

The Indian-speaking population of the United States is presently quite small, those speaking Navaho form the largest group On the other hand, several million Indians live in Mexico, Guatemala, Ecuador, Peru, Bolivia, Brazil, and Paraguay, speaking their native languages

CLASSIFICATION OF LANGUAGES

Indian languages may be divided into three broad categories according to area· Alaska, Canada, and the U S , Mexico and Central America, and the West Indies and South America

Northern Groups. The Eskimo and Aleut languages constitute the northernmost group The Athapaskan languages are spoken mainly in northern Canada but also among the Navaho and Apache of Arizona and New Mexico and among some small groups on the north Pacific coast The Algonquian languages are spoken principally by tribes in the eastern U S and Canada, but also by such Great Plains tribes as the Cheyenne, Arapaho, Blackfoot, and Gros Ventre The Iroquoian group, including the Cherokee language, is prevalent in the eastern States The Muskhogean group, in the southeastern States, includes such languages as Choctaw, Chickasaw, Creek, and Seminole The Caddoan of the southern Plains comprises the Caddo, Wichita, Pawnee, and Arikara tongues The Siouan languages are spoken mainly in the midwestern and eastern U S , the Salishan, in the northwestern States and British Columbia. The Uto-Aztecan languages are spoken largely in Mexico but also by the Ute, Comanche, Kiowa, Pima, Papago, Hopi, and others of the western U S

Central Groups. In Mexico and Central America the most important languages are the Uto-Aztecan including Aztec and the tongues spoken by some tribes in the western mountains, such as the Tarahumara and the Yaqui; the Maya, Quiché, and Huastec groups, spoken mainly in Yucatán and Guatemala, the Otomí and Mazatec groups of central Mexico, the Zapotec and Mixtec of southern Mexico; the Mixe and Zoque of southern Mexico; and the Totonac of eastern and the Tarascan of western Mexico

Southern Groups. The principal Indian languages of South America are the Arawak and Carib, which are spoken by tribes who live in tropical forests These languages were spoken also in the West Indies at the time of Columbus, the Ge languages of eastern Brazil; the Tupi-Guarani of the eastern part of the continent, the Guaycurú and Mataco of the south-central section; the Puelche and Tehuelche of the far south; the Araucanian of Chile; the Quechua (Inca) and Aymara of Peru, Bolivia, and Ecuador; and the Chibcha group prevalent throughout Colombia and extending into Panama and Costa Rica

The classification of American Indian languages into families of common descent is difficult and controversial, primarily because of ignorance concerning them, especially those of South America Indian languages were formerly grouped in some 150 families, comprising 55 in the U S and Canada, and, according to different authorities, 24 to 30 in Mexico and Central America, and 57 to 84 in South America Excluding New Guinea and the Sudan, only about 25 recognized language families exist in the whole of the Eastern Hemisphere Recent studies have greatly reduced, and future studies should further reduce, the number of American Indian linguistic families The use of glottochronology (classifying languages and estimating when the various languages diverged from a common ancestral tongue) and other comparative techniques continues to show the interrelatedness and common ties many languages once possessed

Similarities. On the basis of structure, all Indian languages spoken north of Mexico have been grouped into six great superfamilies, or phyla Although complete verification based on resemblances in words and phonetics is still lacking, studies made in the 1940's and 1950's have tended to confirm this classification, which is generally accepted as a working hypothesis

Five of these superfamilies are the following. Eskimo-Aleut, Na-Dene, including Athapaskan, Tlingit, and Haida, Algonquian-Mosan, including the Algonquian languages and some spoken near the Pacific Coast, such as the Salish languages, Penutian, including many languages spoken on or near the Pacific Coast and some spoken in Mexico, and Hokan-Siouan, a very large group, including many languages of California and the languages of the former Siouan, Iroquoian, Muskhogean, Caddoan, and Yuman families, as well as some spoken in Mexico and Central America The Hokan-Siouan group may even extend into South America

The sixth superfamily in the original classification is the Uto-Aztecan Most modern authorities place Uto-Aztecan with Penutian in a Macro-Penutian phylum that also includes the Mayan languages and Totonac, as well as Mixe-Zoque The latter languages are spoken in Mexico, and it is possible that all the languages of Mexico and Central America as far south as the Costa Rican border fall into Macro-Penutian, Hokan-Siouan, or the other great Mexican phylum, Macro-Otomanguean, which includes Otomí, Mazatec, Mixtec, Zapotec, and many other languages. The Tarascan language, usually called Tarasco, remains an isolated language not yet classified within any of the American linguistic groups.

The South American situation is radically different. Because little is known of their structures, all classifications of languages found in this region have been based on a comparison of vocabularies, many of them inadequately recorded. Consequently, dozens of small and almost unknown languages must be assigned only temporary familial status. An authoritative classification issued in 1952 enumerated 108 such "families." Another theory groups most of the hundreds of South American languages into the major families of Arawakan, Araucanian, Cariban (including Choco), Chiquitoan, Kechumaran (Quechua-Aymara), Macro-Chibchan, Macro-Ge, Macro-Guaycuruan (including Mataco), Macro-Tupi-Guarani (including Witoto and Zaparo), and Panoan.

Much scientific linguistic research presently is in progress, in Latin America as well as in the U.S., on American Indian languages. One school of thought believes that a large percentage of American Indian languages could form a single genetic phylum perhaps 15,000 years old. The interrelationships they possess suggest that the phylum could have evolved from one language in the Americas. Another group of linguists looks to the tremendous diversity of Indian languages and attempts to explain how such variety was produced. J.A.M. & M.R.